A Guide for Manufacturing and Technology Organizations

OVERCOMING INVENTORITIS

THE SILENT KILLER OF INNOVATION

"At Apple, Steve and I were successful because we followed the path outlined by Peter and Tats in this book and didn't fall prey, at least not too often, to inventoritis."

Steve Wozniak, Wheels of Zeus, CTO
Inventor of the personal computer and co-founder of Apple

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The Silent Killer of Innovation

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"As a tinkerer and inventor my whole life, this book addresses a topic that is near and dear to my heart. At Apple, Steve and I were successful because we followed the path outlined by Peter and Tats in this book and didn't fall prey, at least not too often, to inventoritis. I've learned over time that getting inventions to the marketplace is at least as important as the product itself. It was much harder to get people to accept the concept of a computer into their homes and lives than to design it. Too many inventors fall prey to the 'field of dreams' syndrome. This book will drill home the importance of getting your product to market. It's a must read for any inventor."

Steve Wozniak, Wheels of Zeus, CTO
Inventor of the personal computer and co-founder of Apple

From the Back Cover

If You Are in Love with Your Product or Innovation, Your Company will Fail.

Innovation is a perilous process with unreasonably low odds of achieving commercial success with a new product or invention. Corporate innovators get it right only about 1 in 4 times, a deplorably low figure. To achieve commercial success, follow the lead of famous inventor Thomas Edison, the World's Greatest Product Marketer, who got it right almost 100% of the time. He ran a great organization, much of which became global giant General Electric. He maintained a healthy perspective, built an empire from his ideas, lived long and prospered.

Manufacturers must overcome the natural tendency to become emotionally attached to their products and innovations. Organizations of all types can benefit from training their people to be vigilant for inventoritis since it will allow them to improve their commercial success rates while simplifying the innovation processes. Toyota got it at least partly right and has become the world's greatest manufacturer while Ford Motor is on the verge of bankruptcy.

Learn how to identify, manage and overcome the debilitating inventoritis condition, so that you can dramatically improve your results while becoming a great product marketer!

Dedication

To Anne, a great leader, teacher and friend.

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We made good use of Joseph Willmott's Preliminary Innovation Evaluation System checklist and Anne Kramer's excellent insights into inventoritis from her many years as a CEO in the medical technology field. Likewise, Gerard Koldyk has brought along his tremendous experience in many different businesses and technologies from locomotive manufacturing to bone marrow transplants. Thanks also to Lourdes Elardo who wrote insightful articles on inventoritis and discussed them with us from time to time.

Gerard and Anne were each tremendous sources of insight and inspiration. We benefited greatly from their amazing abilities to quickly analyze a business or commercial situation, separating the good from the bad and the ugly. We are saddened that Anne passed away after a heroic struggle with cancer as we were undergoing the publishing process. This work is dedicated to her.

We also owe a debt of gratitude to those pioneers who have come before us and who have contributed immensely to the field of product marketing.

Peter Roosen & Tatsuya Nakagawa

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- The Home Run Hitter's Guide to Fundraising http://happyabout.info/homerun-fundraising.php

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Introduction

Are you about to embark on a venture based on an idea for a new product? Preparing to launch a product that has just come out of the development process? Or is it time to do a post mortem on one that has undergone the full cycle without becoming a commercial success? These can be very uncertain and painful times. We know and understand the pain because we have felt it - often. We have also experienced the joys of successful ventures - a much better sensation. Most innovators don't experience as much joy as they would like to. We're here to help change that. The process involves getting into the right mind set, maintaining perspective and avoiding the numerous pitfalls along the way to achieving commercial success.

So whether you're a venture capitalist, a strategic marketer, an R&D manager… or that indefatigable and solitary inventor… we all have much to gain from learning about why innovation fails. Successful outcomes require avoiding the numerous landmines and obstacles found along the journey. Only a small percentage of innovations meet expectations and we want to increase the percentage that do. We would all like to concentrate our resources on those innovations that are likely to succeed. This book is intended for those whose goal is to profit from these activities. It contains hard-earned wisdom that will save you some serious grief, no matter how you're involved in the business of invention.

“Inventoritis” is a term that we found bubbling up in various places among inventors and managers alike. We need to overcome it to achieve successful outcomes in innovation. We didn't find any explicit references to a definition but we did find numerous references to its core meaning. One example stems from famous inventor Thomas Edison's protégé and long-time friend Henry Ford. Ford made excellent observations and expounded on his experiences en route to his status as a legendary car maker.

We've learned that those who exhibit inventoritis are far less likely to achieve commercial success than those who don't. This is not confined to inventors. Sales people with little or no technical expertise can just as easily fall in love with their products and lose perspective. Steve Jobs is a recent example of someone who did but managed to get back on track with a stream of winning products.

So why go through this exercise? To help people and companies get out of their own way and become more effective innovators. There is a need to protect companies and individuals from tainting their own ideas with unhealthy biases. Our core message for company managers is simply that organizations must identify and treat their people to become inventoritis-free to enable greater return on their innovation investments, while simplifying the innovation process.

We are experiencing less uncertainty and pain in our product marketing practice as we continue to develop a better understanding of what works and what doesn't. We hope your innovation process too will improve. As your success rates go up, the pain you experience should go down. That means that our efforts will have been a step toward changing the world to make it a better place.

Chapter 1

Inventoritis Exposed

The Origins of Inventoritis – The Light Bulb as the Symbol of Ideas and Innovation

Thomas Edison is an American hero. He is credited with the invention of the light bulb, and he played a tremendous role in ushering in modern industry worldwide based on his advancements in electrical energy. Electric light greatly changed the way people lived and worked by turning night into day so that offices and factories could operate effectively without being limited to daylight hours. Edison is widely credited with having over 1,000 patents in his name and is often given the moniker: “World’s Greatest Inventor.”

What is not as well known, perhaps, is that Edison’s penchant for invention was rivaled only by his effectiveness as a marketer. He was in the habit of working backward from the market and doing whatever was needed to most expeditiously fill what he found to be the real or actual need. He was known to always be actively researching what everyone else was doing and had done. He sometimes bought and on occasion stole technology from others.

Few people today know or appreciate that Edison did not invent the light bulb. Joseph Swan was installing them in homes and landmarks in England before Edison's first successful test was completed on October 21, 1879, when Edison's carbon filament lamp successfully operated for only 13.5 hours. Additionally, Edison had bought the Canadian and US patent rights filed in 1874 for a carbon filament lamp by a Canadian medical electrician named Henry Woodward and his colleague Mathew Evans. What Edison did was to create the first *commercially viable* filament lamp which, incidentally, did not occur until more than six months after Edison filed his patent. Edison understood the importance and power of a good public relations and media strategy and was able to capture media attention while others were busy working in relative obscurity. He developed his prototype lamps to the degree they could last over 1,200 hours using a carbonized bamboo filament; however, this advancement was not made until several months after he filed his patent application and made the front pages with his early announcements. Edison then developed Direct Current (DC) electrical power systems to energize the light bulbs. Swan sued Edison for patent infringement and eventually won, resulting in Edison having to take Swan in as a partner in the British company.

In his 1930 book, 'Edison As I Know Him,' legendary car maker Henry Ford, a close friend of Edison, described inventoritis without giving it a name. Ford described an inventor as one who "frequently wastes his time and his money trying to extend his invention to uses for which it is not at all suitable." Ford asserted "Edison has never done this." The context and meaning of the term "uses" should not be limited only to technical feasibility but should include commercial viability as well. Edison and Ford always considered commercial viability a requirement for anything they were involved with. Ford built a massively successful enterprise because he understood thoroughly the importance of this principle.

Many inventors who file patents, including the inventors of the zipper (sewing machine inventor Elias Howe in 1851, Whitcomb Judson in 1893, and much later again electrical engineer Gideon Sundback in 1917), fall into the trap of being too far ahead of their time or otherwise being out of tune with the market. The zipper finally started getting good market acceptance around 1930 and has since become one of

the world's best known products – almost a century later. It did little good for its early inventors. Judson showed his version of the zipper to 20 million (20,000,000) people and sold only 20.

Better known among inventors is Nikola Tesla, inventor of Alternating Current (AC) electrical systems. After some great successes, Tesla lost touch with the market and was later pursuing visions that generated much interest and debate but did not yield marketable products. This is one of the worst outcomes people with inventoritis can experience since their monetary gains never equal the strength of their innovative ideas. Tesla experienced this fully.

On the other hand, Edison, through an extensive network, was able to learn the crucial lesson of not misunderstanding the market with his first patented invention. The following story told by Henry Ford[1] shows that he was obviously quite aware of the typical outcome of inventoritis:

In Common With All Inventors

Mr. Edison, in his first patented device concentrated on something which he *thought* was needed, but which, in fact, was of no use to anyone. In 1868, he took out a patent for an arrangement that would quickly and accurately record the vote of a legislative body. He had the impression that Congress in particular needed his invention so that time taken in voting might be used for more valuable purposes. He still laughs about the reception which this, his first child, received in Washington:

> It was exhibited before a committee that had something to do with the Capitol. The chairman of the committee, after seeing how quickly and perfectly it worked, said: 'Young man, if there is any invention on earth that we don't want down here, it is this. One of the greatest weapons in the hands of a minority to prevent bad legislation is filibustering on votes, and this instrument would prevent it.'
>
> I saw the truth in this, because as a press operator I had taken miles of Congressional proceedings, and to this day an enormous amount of time is wasted during each session of the House in

1. Ford, H. & Crowther, S. (1930). Edison As I Know Him. New York: Cosmopolitan Book Corporation. (pp. 56-57).

> foolishly calling the members' names and recording and then adding their votes, when the whole operation could be done in almost a moment by merely pressing a particular button at each desk. For filibustering purposes, however, the present methods are admirable."

That *cured* Edison of inventing things which he *thought ought to be wanted*. Thereafter he kept to things he *knew were wanted* and which would have widespread application.

Congress still does its voting the same way it did in 1868 but Edison was treated by the committee chairman and overcame his early onset of inventoritis. Once thus inoculated, Edison had a lifelong winning streak with almost 100% of his 1,093 lifetime U.S. patents having been tied to commercial successes. The last part of Appendix B focuses on quantifying his success, and Appendix C lists his patents.

Tesla however, went in the other direction. After some breathtaking early successes, he alienated himself from the marketplace and everyone in it. Tesla was the inventor of Alternating Current (AC) electrical systems and technology, which is continually and widely used throughout the world today. He was in direct competition with Edison's Direct Current (DC) technology. Tesla had the superior technology for many electrical power applications, but Edison's technology held the market for some time even after George Westinghouse, inventor of the railway air brake system, backed Tesla. Edison actively resisted changing from his established DC to the superior AC technology but eventually did make the wholesale change based on market demand.

There are many books written about both Edison and Tesla, their lives, inventions, personal and professional successes and failures. The vast majority of these books fall short in encapsulating a common feature, especially in the case of Edison. They generally have missed the point that, although Edison had taken ownership of the term "inventor", he was the best *product marketer* the world had ever known. After his death, Tesla was eventually credited with the invention of radio communication to add to an already impressive list of accomplishments and today, many scientists agree that Tesla was

actually the greater inventor of the two. Yet he lacked the marketing skills of Thomas Edison, forcing his utter brilliance to be remembered only after his death.

A detailed discussion of Edison's lasting rise to prominence, Tesla's early rise then long fall from grace and the “War of the Currents” battle between their rival DC versus AC electrical systems is provided as a case study in Appendix A. Appendix B contains lessons from these historical references while Appendices C & D contain complete lists of Edison and Tesla's respective U.S. patents. The main difference between these two famous inventors is that Edison was a far greater leader than Tesla, while being free from inventoritis. Edison tended to recruit experts while Tesla generally worked alone. Edison had developed sound marketing processes whereas Tesla had not. Had Tesla been free of inventoritis, he might have won the battle of the competing DC and AC electrical power systems without destroying himself in the process.

What Led These Two Prominent Individuals to Such Vastly Different Outcomes? Inventoritis.

Tesla is the poster boy for this disease, arguably being a greater inventor and scientist than Edison, while self-educated Edison was effectively treated by the congressional committee chairman who rejected his first patented invention, the “Electrographic Vote-Recorder.” Edison lived the rest of his life mostly free of inventoritis and still has the reputation of being the World’s Greatest Inventor. Edison understood and consistently applied sound principles of marketing whereas Tesla did not.

Since Edison’s death, the light bulb has become universally recognized as the symbol of ideas and innovation. Many of the current books and web sites on innovation include a picture of a light bulb.

Why is Inventoritis a Big Issue?

Development and testing activities have been modeled on Thomas Edison's famed Menlo Park laboratory example. This was done on the premise that by establishing systems and processes toward the objective of coming up with winning products through technical research and development activities (R&D), a company would gain a competitive advantage. Vast amounts of money are spent in this area and many companies still pride themselves on the money they spend each year on these activities, usually expressed as a percentage of sales, and typically in the 1% to 15% range. An endless series of winning products is not the normal result. A 2005 Booz Allen Hamilton study[2] of the global top 1,000 R&D spenders found no direct correlation between R&D spending and sales growth, operating profit or shareholder return.

It seems that few companies properly interpreted Edison's example. Microsoft is one that has come quite close, at least in terms of having its marketing strategy properly leading its R&D activities, rather than the other way around. Toyota is also getting it at least partly right by virtue of its lean manufacturing approach. Central to Toyota's lean approach is constant improvement, respect for people and the elimination of all types of waste, including misdirected R&D spending and initiatives.

Innovation giants 3M, HP and Procter and Gamble have been making big publicity splashes with their slogans about innovation and inventiveness while they too have all sorts of problems trying to achieve good results from their R&D spending. 3M had a big hit with its Post-it notes but that had more to do with the tenacity of the inventor than the effectiveness of the company's innovation.process. HP has done quite well overall but not everyone agrees, especially numerous shareholders who got burned from time to time. Consumer products giant Procter and Gamble is revamping its entire R&D process to an open innovation model because spending in the area has been exceeding sales growth with no end in sight.

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2. Jaruzelski, B., Dehoff, K., & Bordia, R. (2005). The Booz Allen Hamilton global innovation 1000: Money isn't everything. Strategy + business magazine issue 41, Winter 2005 Reprint No. 05406. New York: Booz Allen Hamilton.

Ford Motor was the world's biggest R&D spender in 2005 while Microsoft was the biggest one in the previous year. Microsoft seems to be moving forward while Ford seems unable to spend its way out of the innovation rut it is presently stuck in - having lost $12.6 billion in 2006 with few exciting innovations to brag about. Steve Jobs got himself into problems and even got thrown out of his own company. Jobs has since managed to get back on track and is having some great innovation successes at Apple.

Clearly, inventoritis is a big issue where such vast R&D spending produces such unreliable results.

Why We Need to Deal with Issues Caused by Inventoritis

Obtaining more predictable and better results from these substantial R&D investments would lead to competitive advantages. An important metric would be an increase in the percentage or number of innovations that are successfully deployed. Hundreds of thousands of new products are launched worldwide every year, with only a small percentage of the products remaining on the market a couple of years after the launch. Companies that can increase their success rate even a little bit will be able to capture greater market share from their competitors.

How to Identify Inventoritis

An industry metric first introduced in 1992 called the M/E or Grabowski ratio[3] can be used as a measure or at least an indicator of the extent to which organizations are likely exhibiting collective inventoritis.

3. Grabowski, R.E. (1995). Who is going to buy the darn thing? Proceedings of the IEEE Electro International, June 21, 1995, 69-97.

The M/E ratio was developed by engineer turned marketing consultant Ralph E. Grabowski and is the ratio of marketing to engineering investment. The main component of the marketing investment is the often undervalued discipline of “front-end marketing” that includes conducting market research, gathering competitive intelligence, building the business model and analyzing the payback. Marketing investment for the purposes of the M/E ratio does not include sales and promotion expenses.

Grabowski found that the most successful companies had ratios greater than 1.0, spending more in front-end marketing than in engineering. Failures had ratios often well below that. Copier manufacturer Xerox had a ratio of 0.1 and large computer companies Digital and Wang, that were impacted by the advent of the personal computer, had ratios of 0.004 and 0.001 respectively. Personal computer maker Dell and software company Intuit had ratios of 1.5 based on his comparison. Grabowski found that companies with low ratios tended to have inwardly focused engineering cultures.

Other researchers, such as Robert G. Cooper and Elko J. Kleinschmidt, have been investigating the relative amounts of resources applied toward front-end marketing. They have done considerable research work throughout the past 20 years in the product development field. In one study, they found that only small amounts of money (7%) and work (16%) go into the front-end marketing homework. These findings were presented and discussed by Bill Dean in a case study article he prepared for a direct marketing association. Dean[4] stressed the importance of incorporating focus group testing in the product development process. For Dean's article, he also found research revealing that solid up front marketing homework can increase new product success rates by a whopping 43.2%.

To help develop a clearer picture of where an organization stands relative to its inventoritis issues, a careful examination should be made of the budgeting processes, reward and incentive systems, human resources policies and activities, training programs, innovation recognition systems and strategic planning methodologies.

4. Dean, B. (2005, March 28). Case study: Incorporating focus group research into the product development process. DM News, Article 32310. Retrieved March 31, 2007, from the World Wide Web: http://tinyurl.com/2gh29w

It is also important to be able to identify inventoritis issues at the personal level. Human resources people need to have at least a basic understanding of how it impacts various functions. They must also be able to screen and qualify it within individuals to minimize adverse impacts. Managers should be able to determine suitable methods of identifying these issues within their respective enterprises.

Inventoritis should not be much of a problem in large hierarchical companies where the innovation activities are tightly managed and people work in carefully defined jobs that are not entrepreneurial in nature. But then again, a scientist or engineer working deep within a large R&D organization with some of these tendencies could have substantial, albeit hidden influences on the product. The following comments made recently to the authors by Ashton Udall, a professional working in product development and manufacturing suggests this:

> “Taken from a product development and manufacturing perspective, I watch companies and inventors make their way through the trade-off process in which they select their optimal combinations of features, costs, materials, and so forth for a product. We've recently worked on a product requiring a rather simple component as simple and as common as a button for a TV remote product or a shoulder strap for a carrying case. With a common component like this, it's probably a good idea to see if one is already being produced out there that might fit with what you had in mind. Avoid the need to spend thousands on tooling for a new component for your product! Take that money and put it in marketing, or keep it as profit, or put it all on Black in the nearest casino. Why design and build a new TV button?
>
> We sourced a nice alternative component, but the specs weren't quite a match (slightly wider than needed). Rather than modify the designs for this (which would only have been an aesthetic modification), the client is still interested in tooling to maintain exactly what was envisioned. This is where inventoritis and its evil

> cousin 'designeritis' smack into reality. Multiply this approach a few times within one product development process and you're looking at a surefire way to decrease your profits."

Being able to identify inventoritis in individuals and companies or organizations is a prerequisite to being able to apply solutions. The degree to which symptoms appear may vary, but there is no individual or organization that has not at one time or another experienced the consequences of innovations inflicted by the shortcomings of inventoritis. Better tools are being developed to ascertain the extent to which organizations are at risk of squandering resources applied to innovation.

The objective of this chapter was to expose this silent killer of innovation. Strategies for overcoming it for organizational and individual innovators will be covered in later chapters.

Chapter

2 Running the Numbers: Most Innovations Prove Worthless

The number of lone inventors who are able to successfully market their first invention is difficult to know, although it is widely believed by most industry professionals to be very low. There does not seem to be consensus as to how low the success rates are, nor has there been much research done in this area. Fortunately, there are enough data available from corporate innovation processes that some reasonable estimates can be made. Few inventors know what they are up against before they go out and apply for their first patent. The goal of this chapter is to estimate the likelihood of commercial success and suggest why individuals are usually at a severe disadvantage relative to well established corporate or institutional innovators.

For the world's largest and most sophisticated companies, including those with corporate research and development centers, the success rates are certainly much better than for the typical lone inventor. However, the numbers are still poor, with the rate being well below 50% - certainly below what most managers and owners would like.

Companies stay afloat because the products they sell, including new products, rarely rely on patented subject matter. Across a range of industries, companies derive about a quarter of their sales and profits from new products, only some of which are patented. The other three quarters of a company's sales and profits come from yesterday's breadwinners that still have years left in their product life cycles.

So what happens if a company stops innovating? In most cases, it will slowly die. Companies operating in a competitive marketplace need to continually introduce new products or products that are better, faster or cheaper in order to stay in business. They don't need to overdo it with innovations, but there is a need to have something in the works. Companies that are leaders in innovation become the pacesetters for the rest of the industry. The other players are forced to keep up or get knocked out of the never-ending race.

Besides a basic need to constantly introduce new and improved products, another factor that stimulates the corporate innovation process is the tantalizing prospect of huge profits from world-beater innovations. For the few innovations that become blockbuster commercial hits, the rewards can be great. Companies that come up with such innovations and exploit them well can end up dominating their industry categories and raking in huge profits.

There are several references that give the failure rates for new product introductions. The normal range is typically from 70 to 80%. These sources include:

1. Various studies cited by Advertising Age.[5]
2. A study[6] by Linton, Matysiak & Wilkes, Inc. of the top 20 food companies reviewing 1935 new products.
3. A Booz Allen Hamilton study[7] on new product management claiming that one out of seven product ideas yields a successful product.

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5. Brock, D. (1997). Getting the most out of your new product introductions. Partners in Excellence. Retrieved April 27, 2007, from the World Wide Web: http://www.excellenc.com/articles.htm

6. Linton, D.B. (1997, July 1). Market study results released: new product introduction success, failure rates analyzed. Frozen Food Digest 12(5), 76.

4. Boston Consulting Group vice presidents and directors James Andrew and Kermit King claiming 60% to 85% in an article[8] titled 'Boosting Innovation Productivity'
5. Some college textbooks[9] claim 80%.

A study by the Product Development and Management Association titled 'The PDMA Foundation's 2004 Comparative Performance Assessment Study (CPAS)' shows 40% rather than the higher 70-80%. The PDMA figure appears to be based just on the post-commercialization or post-launch failure rate. It does not include all products that go into the development pipeline, rather just those that make it to the launch pad. If one includes all the steps from idea generation, the PDMA study failure rate is over 80%.

From this data, it is quite clear that only about one quarter (1/4) of the products that go into the development process end up being successful. This is a deplorably low figure that applies across a wide range of industries. The data comes mainly from well-established companies, typically the top ones in the various industries. In other words, a success ratio of one in four is currently accepted as the best that can be done in terms of converting ideas introduced to the development process into successful products.

What Happens in the Case of Start-Up Companies?

For these companies which are usually quite small, there is a whole other set of failure rate data involved. U.S. and Canadian statistics reveal that only about one third (1/3) to one half (1/2) of new companies remain in business for at least 3 to 5 years. [10,11]About a third of them

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7. Dean, B. (2005, March 28). Case study: Incorporating focus group research into the product development process. DM News, Article 32310. Retrieved March 31, 2007, from the World Wide Web: http://tinyurl.com/yuzzzp

8. Andrew, J.P. & King, K. (2003, April). Boosting innovation productivity. BCG opportunities for action, April 2003. Retrieved April 27, 2007, from World Wide Web: http://tinyurl.com/23y3cp

9. Friedman, H.H. (2000). Product policy; new product development. Retrieved March 31, 2007, from City University of New York, Brooklyn College Economics Department web site: http://tinyurl.com/22jgv8

10. Knaup, A.E. (2005, May 1). Survival and longevity in the business employment dynamics data. Monthly Labour Review 128:5, 50-57.

make a profit during that time, another third break even and the remaining third lose money. Many of the companies that close their doors within the first few years do so because of business failures. Running a profitable business is obviously not easy.

Multiplying the survival probability for a start-up company with the new product success probability makes the overall likelihood of success for a start-up company to develop and commercialize an invention or new product seem fairly dismal. The math looks like (1/3 to 1/2) x 1/4 = 1/12 to 1/8 overall likelihood of success. Since the probabilities are not entirely mutually exclusive, the more forgiving 1/8 figure will be used. Determining what influence one of these variables might have over the other is beyond the scope of this book. In any event, a 1 in 8 or 12.5% chance of success seems somewhat risky, which is why venture capitalists and finance people generally have a hard time dealing with start-up companies based on a new product idea. However, a well managed start-up company with a highly successful product can generate a phenomenal return.

So, for large and well established companies that have developed sophisticated R&D operations, the odds of a successful new product launch is about 1/4, dropping to about 1/8 for start-up companies. What about the lone inventor? There are no readily available statistics for this. Anecdotally, the number is very low.

Throughout industry, the informal consensus for individual inventors is that 95% of the granted patents issued to them do not return the out of pocket costs that went into the patenting process. It typically costs $5,000 to $20,000 to obtain a U.S. patent. The costs depend mainly on the complexity of the subject matter and the number of rounds in the examination process, with two rounds being the normal minimum. Among these same individuals, those who experience true “commercial success” with their first patented idea, appear to number less than one in a thousand.

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11. Baldwin, J., Bian, L., Dupuy, R., Gellatly, G., Statistics Canada (2000, February). Failure rates for new Canadian firms: New perspectives on entry and exit. Minister of Industry / Statistics Canada Catalog no. 61-526-XIE. Retrieved March 31, 2007 from Statistics Canada web site: www.statcan.ca/cgi-bin/downpub/freepub.cgi

Inventions for the purposes of this discussion are limited to those covered by patents. Commercial success is defined as receiving enough money from the sale of the patented subject matter or sale of the patent itself such that all the costs, including the applicable overhead costs over time, are adequately compensated, plus a reasonable rate of return. Also included in the costs are the market value costs of all materials, products and services used in each step of the process from the initial idea generation through to the sale or deployment of the patented products or technology. Depending on the invention, these costs will vary from a low in the $50,000 to $100,000 range to millions or tens of millions for a serious full scale product launch.

The very low success numbers for lone inventors seem quite reasonable when three additional variables are taken into account:

1. Experience
2. Resources and
3. Contacts

These are tied together under the umbrella of leadership abilities and expertise. Suppose that each of the three variables has a rating from 1 to 10, with 1 being the lowest and 10 being the highest. A lone inventor with no experience, no money and no contacts would score one out of 10 or 1/10 in each area. Multiplying these three probabilities together would yield 1/10 x 1/10 x 1/10 = 1/1,000. On the other hand, someone who is a great leader with tremendous relevant expertise and experience, has adequate resources to fund and otherwise support the development and commercialization of the new product, and has all the necessary contacts to make it work, would score 10 out of 10 in each of the three areas. Multiplying those probabilities together would yield 10/10 x 10/10 x 10/10 = 1,000/1,000 or 1. This set of probabilities multiplied together can be called the individual's 'capability factor' or “CF.”

Continuing the exercise, assuming the lone inventor doesn't own a well established company, take the start-up company probability of successfully launching a new product at 1/8 and multiply it by the individual's CF. In the worst case, that would yield 1/1,000 x 1/8 = 1/8,000 and in the best case, the yield would be 1/1 x 1/8 = 1/8. This

gives a wide range, from a one in eight (1/8) chance at one end to one in eight thousand (1/8,000) at the other. This fits well with the “one in a thousand” notion.

A typical case might be an inventor working on his or her 3rd or 4th commercialization project. With some experience (say a rating of 5 out of 10 or a 5/10 ratio), half the resources needed to get through the development and launch process (5/10), and half of the contact score (5/10) for a total CF of 5/10 x 5/10 x 5/10 = 125/1,000 or 1/8. That means this person would have a likelihood of 1/8 x 1/8 = 1/64 or a 1 to 2% chance of making it work. These are still not great odds.

Now, how would world famous inventor Thomas Edison have scored in one of his later years after he was well established? He certainly had all the experience, resources and contacts needed to make it a success. He also had a family of well-established companies in operation. In that case, his capability factor or CF of 1 would be multiplied against the large company successful launch probability of 1/4. For Edison the overall probability of a successful product launch based on this model would be 1/1 x 1/4 = 1/4, the same as for a big and well established company with all the necessary R&D infrastructure in place, which is exactly what he had. Edison actually did much better than this.

The vast majority of Edison's projects were commercial successes. An example of a very expensive one that did not do well (he lost millions of dollars) involved developing iron processing technologies and building facilities to extract iron from low-grade ore. While he was in the midst of the development process, a large high-grade ore body was discovered by a competitor that made his developments designed for low-grade ore bodies largely moot. Edison was able to offset the losses by applying the important new technologies he developed to other areas such as pioneering the manufacture of cement. He eventually managed to turn the failure into a success. Virtually all the world's cement is now made in rotary kilns based on those Edison patented. Furthermore, the high-grade iron ore body did not last forever and modern ore-processing systems and methods have been built on Edison's developments.

Edison's commercial success rates were much higher than 1 in 4 or 25%, mainly because his inventoritis-free approach to innovation was radically different and better than the ones now in use by most corporate innovators. There is a large inventoritis variable in the current corporate model that Edison managed to overcome. His overall number was closer to 100%. The last section of Appendix B looks at Edison's historical success rates and contrasts them with those of Nikola Tesla. Edison achieved an almost perfect 100% lifetime success rate that has never been matched by any company or individual since, even over a large number of innovations. Tesla's rates were similarly excellent while he was involved with Westinghouse after leaving Edison's employ. But once he went out on his own in around 1900, they dropped to about 20%, matching those of the typical modern corporation a century later. The numbers clearly suggest that modern industry has adopted the Tesla approach to innovation rather than the extremely successful one employed by Edison with its less than 1% failure rate.

This simple model was designed to quantify the probability of success for lone inventors relative to both new and well established companies. It is intended to be taken as a starting point for further work and to give rough estimates of the chances of success for various types of inventors. It highlights the fact that inexperienced individuals with few resources and no networks of contacts have a very slim chance of successfully commercializing their first ideas or inventions. This model can be used to help guide these individuals toward improving their chances of achieving commercial success.

One of the main reasons most lone inventors (also referred to as independent inventors) fare so poorly relative to corporate innovators is that inventoritis seems to be more of a problem with them. The corporate innovators also fare as badly as they do due to inventoritis issues. Lone inventors and corporate innovators alike all need to overcome it. Lone inventors also need to strive to develop relevant experience, amass sufficient resources, and build a suitable network of contacts in order to achieve commercial success with their ideas.

Developing great leadership skills along with a good understanding and appreciation of the innovation process is also essential for an individual working on achieving commercial success through innovation. Fortunately, most of these factors are well within an

individual's control. Individuals can work on each of the key areas, dramatically improving their chances of success. For individuals with severe inventoritis, their ideas are almost always worth less than zero when the financial results are tallied.

Do Patents Count?

Most inventors have a portfolio containing granted patents and other forms of intellectual property including trade secrets. There are also other types of intellectual property. Copyrights and trademarks are among them. For example, computer software is usually protected by copyrights rather than patents. The focus on patents in this book helps to simplify the discussion. There is a large body of detailed data available on patents and since this form of intellectual property is most closely associated with inventors and manufacturing innovations, it will be used throughout the ensuing discussion.

A patent is not a complicated thing in and of itself. It is basically a contract between a national government and one or more inventors in which the government grants the owner of the patent a limited period of exclusivity (usually between 15 and 20 years) to exploit the invention. The inventors are often not the owners because patents can be rented out (licensed), donated or otherwise pledged to a company (assigned), and generally bought, sold or otherwise transferred like other types of property. In exchange for granting a patent, the government gets a full public disclosure of the invention. The public benefits by having access to a comprehensive permanent record of all the inventions disclosed in the numerous patents over the years. The patent owners have a time-limited opportunity to legally monopolize the invention. That is really all there is to a patent.

To obtain and maintain patents, there are numerous fees paid by inventors or patent owners to the various involved government patent offices, patent agents and attorneys. Unless the fees become a problem, obtaining a patent is usually easy except when an application is for a broad patent. Once the patent term has elapsed and the patent therefore becomes void or extinct, anyone else may also go ahead and make or use the invention with impunity.

During the term of the patent, a patent owner may sue any infringers in federal courts for damages caused by the competing sales. They may also seek legal injunctions and Court Orders to restrain the infringers from carrying on the infringing activities. That litigation can become very expensive and complicated and the one doing the suing usually pays substantial court costs, even if they win.

In practice, most patents are relatively worthless because they cost between $5,000 and $20,000 to obtain and apply to things that do not become commercial successes. Furthermore, they are often narrowly defined and relatively easy to circumvent. Litigation costs for infringement lawsuits can run up into hundreds of thousands or millions of dollars - more than most commercially successful patents are worth.

Since the vast majority of issued patents are not worth the paper they are printed on, it is reasonable to assume that someone with a patent might have an inventoritis problem. This is also true for many companies that get carried away with filing patent applications for almost everything they possibly can.

Chapter

3 Inventoritis is Disruptive

In recent years, there has been much debate and discussion of the rapidly increasing rate of change in the context of globalization and the threats posed to established businesses, entire industries and the entire industrial sector of several countries. The most popular example is the present shift of manufacturing activities and related jobs from the United States to China and to other countries where labor costs are a fraction of those in the United States. This perceived threat is not new, although the numbers of affected industries and involved jobs are much higher and the rate of change is much faster now than in the past. These and other types of threats are now commonly referred to as being “disruptive.”

This differs little from the debate throughout the 1970s and 1980s when Japan's advances in industrialization were seen as a similar threat although the term “disruptive” was not used to describe it. At that time, there was the additional threat to jobs posed by a great increase in the level of automation replacing traditional methods of manufacturing. Throughout the developed world, very large R&D investments were made in robotics, computers, artificial intelligence and other technologies that led to increased

productivity and quality improvements in all sectors of the manufacturing economy. These investments were generally aimed at areas that would improve gross profit margins and were largely successful. A good example was the market rewarding automakers for quality improvements - led by Japanese producers. Japan, a small country, became a global powerhouse.

The current shift of industries and jobs to China and other lower cost countries seems much broader and is not yet based on competing through margin-improving technologies aimed at increased quality and productivity. Producers operating in such countries have been increasingly exporting high volume, low cost 'knock-off' products to developed countries. The world's most populated countries, including China and India, are simultaneously undergoing rapid industrialization as part of this process. Like Japan before its big quality improvement push, these countries are competing by exporting as many goods as they can to mainly western markets, especially the United States. The massive margin-improving R&D investments will likely follow, as they did in Japan's case. China, the world's most populous country with a quarter of the global population, is leading the charge and has recently become a global player. This shift appears to be very large compared to Japan's earlier rise.

To keep up with these greater and more rapid changes, a company's typical knee-jerk reaction and blind, illogical practice has been in many cases to arbitrarily increase its spending on technical R&D activities to remain competitive and to attempt to protect itself against competing technologies that could undercut existing business. Harvard Business School professor Clayton Christensen in his 1997 book 'Innovator's Dilemma'[12] outlines and discusses the concept he called “disruptive technology” that now forms part of the business vernacular. The term “disruptive” applied to the globalization developments mentioned at the beginning of the chapter came about after Christensen's work was popularized.

The main conclusion of Christensen's analysis is that in the face of potentially disruptive technologies, even well-managed companies are bound to fail because sound management decisions will take these

12. Christensen, C. M. (1997). The innovator's dilemma: when new technologies cause great firms to fail. The management of innovation and change series. Boston, Mass: Harvard Business School Press.

companies up market in a one-way direction, making them unable to respond in time to disruptive innovations that encroach from the bottom of the market with unique and disruptive value propositions.

Little consideration has been given to the psychological aspects of the decision-making process that can prevent companies from properly addressing potentially disruptive technologies in time. The idea that company management can place blame for their companies' failure to address changes in the marketplace on such externalities as apparent “disruptive technologies” is outrageous. Fortunately, this and other academic arguments for failure are overcome simply enough when proper consideration has been made for inventoritis. However, to do so effectively, there needs to be a clear understanding of marketing objectives, what the term “marketing” really means and what a product marketer should be doing.

Definition of Product Marketer

So, what exactly is a “product marketer” and what is the definition of “product marketing?” The answers are not as obvious as they should be. In fact, there are conflicting definitions of “marketing” that can lead to considerable confusion. The definition of marketing used herein - the process of anticipating, identifying and satisfying customer requirements profitably - suggests it is the core of what a business is all about and therefore a clear leadership role. That differs greatly from the opinion held by many that marketing is or ought to be primarily a support or management function rather than a key strategic leadership issue. This confusion surrounding the various definitions of marketing and the related roles is a serious problem in modern industry. Thomas Edison was never one to be confused in regard to this topic.

The confusion on what marketing means has been further confounded by the creation of the concept of “product management” and the role of a “product manager” in 1931 by consumer products giant Procter and Gamble. Since then, product management and product managers have become standard throughout industry. Linda Gorchels, author of 'The Product Manager's Handbook'[13] is an authority on the subject of product management. She defines it as “a matrix organizational structure in which a product manager is charged with the success of a

product or product line, but has no direct authority over the individuals producing and selling the product. Much of the work of a product manager is through various departments and cross-functional teams, almost as if the product manager were operating a business within a business." She notes various limitations of the product manager role that often serves as a "training ground for young executives." From her description, it is not perceived as very important role in most companies.

Another marketing expert who has considered the definitions of marketing roles is Steve Johnson at Pragmatic Marketing (www.pragmaticmarketing.com) which mainly serves high-tech companies. He observed that product management, product marketing, program management and other titles in high-tech companies are poorly understood and are defined differently in various firms. He recommends a three-person product management team as an ideal solution for many companies with a technical product manager and a product marketing manager reporting to a director of product strategy or product line manager.

The consensus is that product managers are more internally-focused while product marketing managers are more externally-focused. There is considerable overlap of responsibilities, as there is on names, so this becomes fuzzy. Gorchels, Johnson and others seem to confirm, yet decry as problematic, the widely-held view that marketing is more a supporting function and not a top level leadership role.

Rather than placing and enforcing marketing as important above all else, most companies place innovation or R&D activities at the same level as marketing or sales with marketing and sales often combined under a single vice president and R&D under a different vice president. Structurally, in most companies, by default, the CEO is responsible for anticipating, identifying and satisfying customer requirements profitably. This should not be the case unless the CEO is an expert in this domain. The traditional marketing vice president does not lead the product marketing or govern the strategy unless he or she has

13. Gorchels, L. (2006). The product manager's handbook (3rd ed.). New York: McGraw Hill (pp. 305 & 325)

sufficient expertise plus direct control over the R&D function. Microsoft, the world's largest R&D spender in 2004, appears to have taken a lead in correcting the misalignment of roles.

Herein, the definition of product marketer is a person with the authority and responsibility for leading the process of anticipation, identification and satisfaction of customer requirements in a profitable manner. If that requires the CEO to become involved and lead the way, then so be it. This is a leadership, not a managerial, role. The word manager should never appear in such a title because managing as opposed to leadership is generally viewed as an efficiency process. Peter Drucker and many other authorities have written about the differences between managing and leading and the point here is that product marketing needs to be run by a leader. Thomas Edison's key characteristic was that of a leader.

Perhaps the most revealing source of Edison's greatness as a product marketer is his former employee, protégé and long time friend, Henry Ford, who's Ford Motor Company, is currently the world's fourth largest automobile manufacturing company. Henry Ford has been credited with pioneering the mass production assembly line, fixing sales prices on future anticipated costs and then forcing the costs down through volume production. This strategy is known today as a 'loss leader' strategy. But Ford himself largely credited Edison with having pioneered and developed these and other marketing strategies. Ford's attempts to credit Edison with these developments have gone largely unnoticed.

The examples that follow show that companies that properly assess and manage potentially disruptive technologies from an inventoritis-free vantage point do not become subject to the gloomy predictions made by academics such as Christensen.

Since Christensen's work became popular, almost anything that came along and knocked a business off course was labeled by management as “disruptive.” These managers have been using this as an excuse for poor performance, especially in the area of corporate innovation. Such an excuse is not necessary since businesses that are free of inventoritis can always anticipate and identify new market opportunities without them becoming disruptive.

The remainder of this chapter considers how some companies addressed potentially disruptive changes. It also sets the stage for applying various solutions including those presented in later chapters that can help a company avoid or manage these challenges to its advantage.

Were Minimills the Destroyers or the Saviors of Integrated Steel Mills?

One example of a potentially disruptive technology was the advent of minimill steel-making technology that encroached and severely undercut the business of large, integrated steel producers such as U.S. Steel since the 1980s.

Traditionally, steel is made in large plants where iron ore, coke and limestone are converted into finished steel shapes in large integrated mills. These plants need to be large to take advantage of the required economies of scale to cost-effectively create steel products from raw materials. Gigantic furnaces are required. The mills that process the molten steel into finished shapes are huge complex facilities. They are integrated with the iron conversion operation so that the freshly molten steel from these huge furnaces can all be efficiently converted into marketable products.

The minimill businesses, developed mainly by Nucor and Chaparrel, operate using scrap steel rather than iron ore as the main input material. Furthermore, minimills use much smaller electric arc furnaces to melt the scrap into steel so the scale of the operation is about one-tenth that of the integrated mill. These smaller quantities are continuously cast into nearly finished shapes requiring far less downstream processing. At first thought this “recycling” solution would seem to offer an alternative with great potential for marketing steel products.

It is true that the costs of producing steel products using minimills is substantially lower than with integrated mills. However, minimills tended to produce lower quality finished steel. As a result, minimills were initially able to only compete in the bottom end of the steel

business, making concrete reinforcement steel bar, also known as rebar. The integrated producers were happy to be out of this part of the business because there was no profit in it and they could concentrate on higher margin products. The minimills viewed the business differently, making a profit in this low end of the market.

Over time, through effective R&D investments and equipment upgrades, the minimills were able to improve the metallurgical quality and consistency of their products. They were able to move into the next higher market area, that of simple structural steel products including bars, rods and angle irons. Again, the integrated producers allowed this to occur as they concentrated on their higher margin business at the upper end of the market. The market shift was rapid. By 1980, the minimills had captured 90% of the rebar and 30% of the bar, rod and angle iron market. They took the whole market by the mid 1980s. Similarly, the structural beams market went to the minimills unchallenged by the early 1990s.

Throughout the 1980s, the integrated producers made much greater profits as they were concentrating their business on high-quality rolled steel sheet used to make cars, cans and appliances. They were able to target the bulk of their investments at these areas while closing many of their unprofitable operations. Share values of these integrated producers increased dramatically during this period.

But the minimills did not stop their advance once they had captured the entire structural steel market. They invested in new, small, cost-competitive, continuous thin-slab casting and rolling technology that could be fed from the electric arc furnaces. There was an expected 20% total cost reduction for using this approach to making sheet steel. The quality was not high enough to reach the car, can and appliance market so they were left with markets like construction decking and corrugated steel for culverts. Nucor captured 7% of the large North American sheet steel market by 1996 and was working on improving its quality to continue encroaching on the market, as it has continued to do during the past 10 years.

But were the minimills really a disruptive technology? The minimill and integrated mill approaches involved completely different types of input raw materials. Scrap steel used to feed the minimills needs to come from somewhere. Minimills can be viewed as recyclers and simply part

of the chain of converting iron ore to steel. It makes sense for the integrated mills to convert iron ore directly into the high volume, high value, sheet steel where the greatest profit margins are available. The entry of the minimill can be viewed as a stimulant, helping to improve the overall efficiency of the industry.

Even if it could be assumed that, instead of starting with scrap steel as the primary input material, the minimills used the same type of raw materials as the large integrated steel mills, there is no need to assume that integrated steel producers would face ruin. If the smaller minimill steel-making technologies are indeed superior, the larger producers can introduce them directly, by acquiring existing minimill operators or by creating spin-offs focused on the minimill technologies. This would be market driven. The development of the minimill technology was itself market-driven, with a compelling competitive advantage for more enterprising companies like Nucor - using raw materials in much smaller scale, highly efficient operations.

Other reasons for the minimills having taken market share from the traditional integrated mills have nothing to do with technological advantages. For example, the integrated mills had substantial pension and retirement obligations referred to as “legacy costs” for many thousands of retired workers whereas the newly-created minimills had none. Nucor also has no unions and its workers are paid largely on the basis of performance. This was and remains a highly motivated and productive workforce. There was also far less capital required to open a minimill than to open or refurbish an integrated mill. These differences greatly reinforced the technological advantages.

In the last 10 years, both integrated and minimill producers have grown substantially. U.S. Steel more than doubled its revenue to about $15 billion while substantially downsizing. Nucor more than tripled its revenue to the same approximately $15 billion, without having the heavy baggage of old plants and a huge bloated and cumbersome organization. Many of the old line integrated operations have been shut down, largely because of the minimills. Their fate was probably destined for larger scale demise, however, because without the benefit of the minimills, the United States steel industry would have likely been collectively knocked out of the global steel market. So in an ironic but positive twist of fate, instead of having foreign companies taking over the business, the surviving integrated steel mills became stronger and

more competitive. Plus Nucor and other minimill operators have grown into world class competitors themselves. European and Asian steel conglomerates, including Japanese giant Mitsui & Co. with its various affiliated steelmaking companies, have been buying up global market share but have not taken over U.S. Steel or Nucor which remain as strong American players in the global steel market.

The leaders of the surviving integrated mills did an excellent job in addressing the problems within the industry as the minimill technologies were coming along. They used an inventoritis-free approach in understanding their markets properly while developing and executing a sound marketing strategy, focusing on producing high volumes of high quality sheet steel directly from raw materials in efficient, integrated operations. They did not fall into the technology game and start trying to integrate minimill technology into their already overly-complicated operations. Instead, they let the minimill operators take over the complicated range of products at the lower end of the market while shutting down their antiquated plants and getting rid of a huge part of the bloated infrastructure and organization. Had they not done so, there is a good chance they would have been knocked out of the global steel industry as production from lower cost countries ramped up.

The next example will illustrate a simple case where an existing corporate player was able to avoid market share loss by cleanly blocking a potentially disruptive innovator entering valuable markets it wanted to keep to itself. It differs from the steelmaking example in which the incumbent players let the new players come along and continually undercut the bottom end of the market.

How did General Electric Handle the Threat of the Patented Hybrid Railway Locomotive?

The diesel-electric freight locomotive manufacturing industry in North America has a very small number of players with only two dominating the market since the 1970s. General Electric (GE) owned the market

with a 60% share in 2005. Prior to 1983, General Motors' Electro-Motive Division (EMD) had a 60% share. The market shares have slowly and steadily reversed for these two players.

This locomotive manufacturing business is roughly split into three product categories: yard switcher locomotives in the 1,000 to 2,000 horsepower range, road switchers in the 2,000 to 3,000 horsepower range and road or line-haul locomotives above 3,000 horsepower. A diesel-electric locomotive is basically an electrical power plant on steel wheels. A diesel engine powers a DC generator or an AC alternator that in turn generates electricity which is fed to big electric motors called 'traction motors' that turn each axle. They come with either AC (alternating current) or DC (direct current) traction motors and there are advantages to each, with each type being used in roughly equivalent numbers. Each railroad has its own preferences.

For locomotive manufacturers, the most profitable units sold are the ones in the high horsepower range selling for somewhere in the range of $1.3 to $2.2 million each, depending on the horsepower, whether AC or DC traction and various other considerations. Higher horsepower leads to higher prices and the AC traction models are more expensive than DC models. There are not many models to choose from and there are good profits to be made in selling parts and maintenance service packages to the host railroads. The yard switcher locomotives, used to move railcars around the yards, are considered to be at the low end of the market.

For yard switching needs, railways often keep fixing tired old locomotives and putting them into yard service where they can last as long as half a century. It costs hundreds of thousands rather than millions of dollars for the yard locomotives and they don't cost nearly as much to maintain since they don't work as hard as the road locomotives. These yard engines tend to be fuel hogs and produce a lot of pollution. Every time someone starts moving them, there is a big puff of smoke as the engine ramps up its power to move from one part of the yard to another or to pull or shove a cut of cars along one of the yard tracks. Since they only move 10 to 20% of the time, they spend the rest of the time idling, burning at least a barrel of diesel fuel per day simply idling between tasks.

A small upstart company from Canada called Railpower Technologies started producing a line of patented hybrid yard switching locomotives in 2001. These 2,000 horsepower hybrid locomotives each have, instead of a big 2,000 horsepower engine, a small diesel engine of about 500 horsepower running at constant speed and high efficiencies whose job it is to charge a large bank of batteries that provide the additional horsepower when needed. Instead of throttling a big 2,000 horsepower engine up and down for each movement while idling the engine most of the time (burning fuel in a big engine while not doing any work), the hybrids work by drawing down the batteries when they need the most power. The smaller diesel engines in the hybrids start up and shut down automatically depending on battery levels and power needs. The net result is that they burn about one-third less fuel and produce about 90% less smoke.

But hybrid locomotives are expensive, at about a million dollars each. Another drawback of the hybrids is that they rely on batteries, an unpredictable and under-developed technology area.

If hybrid locomotives were less expensive, they could have been categorized as a market-based disruptive technology coming in at a low price point. The fuel cost saving with the hybrid does much to make it more competitive but doesn't quite make it work economically. Further higher fuel prices can change that. What does make a significant difference is government intervention through ever tightening environmental regulations on air pollution. A technology can be disruptive for non-economic reasons so those relevant factors need to be taken into consideration. In any event, a market has developed for these hybrid yard locomotives and there are hundreds now being produced although many are being recalled due to problems with the battery technology

In 2006, Railpower president and CEO Jose Mathieu, like the minimill operators from the previous example, confirmed his view that the better market opportunities were up-market, with higher horsepower locomotives. Beginning with the base developed in the yard switchers, Railpower has produced innovative designs for road switchers and began manufacturing them. But this is as far as things have progressed and Railpower has a very big challenge in taking additional market share. Unlike the minimill case where the integrated producers let the

minimills encroach on their markets, while themselves focusing on the upper end, higher profit portion of the market, GE has built a fireline that Railpower will have a very difficult time crossing.

In early 2005, shortly after Railpower started gaining market acceptance of the hybrid yard locomotive, GE announced a hybrid road switcher locomotive. GE has not built any yet but has let the industry and media know all about it. From the GE press announcement currently posted on the corporate website:[14]

> The future of rail is just around the bend.
>
> GE engineers are designing a hybrid diesel-electric locomotive that will capture the energy dissipated during braking and store it in a series of sophisticated batteries. That stored energy can be used by the crew on demand - reducing fuel consumption by as much as 15 percent and emissions by as much as 50 percent compared to most of the freight locomotives in use today. In addition to environmental advantages, a hybrid will operate more efficiently in higher altitudes and up steep inclines.
>
> GE engineers are developing a hybrid locomotive with the goal of creating the cleanest, most fuel-efficient high-horsepower diesel locomotive ever built.

While issuing a pre-emptive marketing announcement (note this Edison marketing technique) GE was investing heavily into the development of suitable batteries for use in high-horsepower hybrid locomotives. And as Railpower essentially just treads water in the hybrid market, moving up from the current low horsepower units and focusing its R&D on high-horsepower units, GE continues advancing the core enabling technology in a rational way. By the time the market has ripened in line with GE's forward-thinking strategies and the technical feasibilities have been established, (assuming hybrid road locomotives can be proven to be practical,) GE will be ready - and far before Railpower.

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14. General Electric Company (2005). Hybrid locomotive: The future of rail is just around the bend (file eco-050503). Retrieved April 30, 2007 from GEC corporate web site: http://tinyurl.com/2b3blu

In addition to GE having firmly placed a strategic product offering at the place in the market where it is not willing to let a competitor go unchallenged, GE has been able to capitalize on its huge size, both the size of the parent company and of its installed base of locomotive fleets. It can also effect price changes strategically to make it very difficult for competitors to gain a foothold in its key markets. As a result, General Motors left the locomotive business in 2005, having sold its EMD subsidiary to a leveraged buyout group.

GE has done an outstanding job in earning its current firm position in the market over the past 25 years, knocking General Motors out of the business completely. GE's recent profits from the locomotive business are excellent and there seems to have been no problem establishing strategic firelines to prevent new competitors like Railpower from taking market share GE isn't willing to concede.

An example involving popular consumer products would be the new digital camera technology that exposed traditional players in the photography field to big challenges. This example will illustrate that even extreme potentially disruptive technologies can be managed to advantage. This shows that industrial and consumer products companies share many similarities in the ways they can manage innovation and technological change.

How did Kodak Handle the Big Switch to Digital Photography?

Kodak (Eastman Kodak Co.) is a Fortune 500 company that was recently faced with a disruptive technology, the digital camera. George Eastman founded the company in 1880 and Kodak started becoming a household name when he introduced the user-friendly Brownie camera in 1900, soon followed by a home movie camera, projector and film. Photographic film and paper is where the company has been making most of its money ever since. The company developed its film business completely in-house and has dominated the film market for a century. Film, photographic papers and photo-processing chemicals became

such a common item that Kodak became one of the largest companies in the world. At its peak in 1988, the company had almost 150,000 employees worldwide.

The first filmless electronic camera was invented and patented by Texas Instruments in 1972. Mass marketing the product was a big technical challenge with a difficult road ahead especially when trying to get to the point where digital cameras would produce high quality images. The threat was that people would be taking pictures without using film and without necessarily needing to print them out on photographic papers. One can hardly imagine a better example of a potentially disruptive technology because a whole new business model would be needed for Kodak if this digital technology was going to develop.

Digital camera technology did continue to develop and in the year 2000 sales of digital cameras matched and began to surpass sales of film cameras. There were US$1.9 billion in digital cameras representing 6.7 million units sold in North America that year, about 10% more in dollar sales than for film cameras. In 2006, there were about 30 million digital camera sold in the US market and sales appear to have peaked. A further potential disruption is that wireless telephones are now being equipped with built-in digital cameras, with many already thus equipped and the prediction being that about 70% of them will be by 2009.

So what happened to Kodak? Although the company went through a severe transition that is ongoing, it still occupies a high position on the 2006 Fortune 500 list as #155 with 2005 sales of US$14.3 billion, a 5.6% increase from the previous year, albeit with a net loss of $1.4 billion. Net losses in 2006 were narrowed by $750 million to $600 million. There were 51,100 employees in 2005, a drastic reduction of about 2/3 of the total number from the 1988 peak of almost 150,000 employees, with further reductions expected.

The transition is not yet complete and success is not assured, but Kodak remains a global player operating with a radically changed business model. It now operates in the high technology market while still supplying its traditional products where there are suitable markets for them.

Kodak is taking some serious hits but remains alive as it adapts to radically-changing market conditions. It has not become a casualty of technological change, nor does it need to become one, so long as it continually adapts to changing conditions. The following paragraphs provide details of the transition which is a substantial work in progress.

Kodak chose to embrace digital camera technology. There was a series of focused technical R&D innovations aligned with the upcoming market needs. During the 1970s and earlier, when digital camera technology was in the formative stages, Kodak was involved. Kodak invented various sensors to convert light to digital images and was developing this technology through the 1980s.

It was the Kodak scientists who developed the world's first sensors that were in the megapixel category - the threshold above which image quality became useable for still photography. Their first successful sensor was able to record 1.3 million pixels and digitally produce a reasonable quality 5x7 inch photograph. Kodak released the first professional “DCS” digital camera system using a Nikon F-3 camera equipped with Kodak's 1.3 megapixel sensor. This expensive product was released in 1991 and targeted at journalists, realtors, insurance adjusters and others who were willing to pay a premium price for being able to capture quality images in the field for quick delivery and use elsewhere.

Like Thomas Edison, the Kodak company obtained over 1,000 patents as part of an effective marketing strategy. However, Kodak's patents were all in the digital photography field, as part of a defensive fireline.

For 2006, Kodak owned 16% of the United States digital camera market, increased from less than 15% market share in 2002. This was done against formidable competitors, including Japanese consumer electronics giants Sony (17%) and Canon (20%). Konica Minolta was knocked out completely and Panasonic, Nikon, Hewlett-Packard, Olympus and Fujifilm remain as smaller players. New competitors in 2006 include Samsung and Matsushita. For comparison, Sony had 24% of the market in 2002, reduced to around 17% currently.

Kodak created and aggressively promoted some great innovations through the 1990s to introduce the public to the idea of digital photography. Microsoft, IBM, Hewlett-Packard and FedEx Kinko's

joined in with Kodak on various co-marketing campaigns. Photo discs, image editing workstations, photo kiosks, internet image exchange networks and special color printers are among the product offerings.

Kodak developed more customer contact points through digital kiosks, marketing specialized computer peripherals through various outlets, while making deals with wireless telephone multinationals. To get into the market for wireless telephones with built in cameras, Kodak established internet-based image swapping centers. In 2006, the company entered into a ten year global licensing and marketing arrangement with Motorola to codevelop camera-equipped wireless phones with Kodak sensors. These sensors will allow people to use the phones with Kodak kiosks and other services.

Kodak also expanded its traditional business into developing markets such as China, India, Eastern Europe and South America. Inexpensive disposable film cameras became another product offering.

Acquisitions were part of the strategy. One of Kodak's noteable acquisitions was the billion dollar acquisition in January 2005 of Creo Inc., a publicly-traded Canadian company specializing in supplying prepress printing and workflow technology and systems used by commercial printers worldwide. This was to round out Kodak's move into a solid position in graphics communications, part of its digitally-oriented growth strategy.

Creo had a poorly-performing stock. It also had the reputation of being a big R&D spender at over 13% of revenue in 2004 relative to its competitors. There was a failed shareholders' revolt leading to the acquisition. The dissenters argued that Creo was a poorly-performing company largely due to bloated cost structures and excessive R&D spending. In 2006, the R&D activity at this new division of Kodak was still a contentious issue. Kodak is still in the process of integrating the acquisition and it will be interesting to see how this develops and what strategies are applied to improve performance. There are likely good opportunities to improve this acquisition which may turn out to have been an excellent bargain for Kodak.

The way that Kodak addressed the potentially-destructive digital camera technology was a complex combination that included exiting some market areas, embracing digital camera and related digital

technologies, acquiring companies in related fields and putting in firelines to protect certain market segments. The R&D people as well as the others involved did an impressive job in executing initiatives responsive to the radically-changing market.

Kodak is surviving the disruptive fire that is quickly turning its traditional photographic film and papers business to ashes. However, many challenges remain and if the company does not keep moving forward the way it has been, it might end up getting cut into pieces by inside or outside operators, or get absorbed by a large competitor such as Hewlett Packard.

George Eastman's 19th century company has become an inspirational example of what is possible in the face of extraordinary circumstances. It has certainly been a difficult time for a great many of the employees and families impacted by the recent and continuing massive reductions in the number of jobs. However, it is also important that the company is still around for those who still have their jobs and for the new employment opportunities created in the change process. Change is certainly not always easy, Kodak's transition is by no means complete, and there are many things that can go wrong. But Kodak has made it this far and has again earned its respected place in history. The company went through difficult times yet did not fall from industry leadership.

Inventoritis-free Marketing Strategy Must Lead R&D Initiatives

Most company managers and owners have problems dealing with innovation, an area most companies find to be quite challenging. Some companies handle potentially-disruptive marketplace and technological changes just fine while others get destroyed in the face of them.

If we look upstream for the root causes of this incongruity, it becomes readily apparent that inventoritis has much to do with it. Henry Ford's earlier description of an inventor as one who “frequently wastes his time and his money trying to extend his invention to uses for which it is

not at all suitable" (followed by his assertion that "Edison has never done this") can be extended to include the institutional inventor and supporting organization. The responsibility for products, especially new ones, is often left to the technical people in the R&D centers who are somewhat isolated and not tied into the marketing strategy center. One can hardly blame them because, in many cases, there is no center for marketing strategy. This kind of confusion and poor leadership in the innovation process can easily lead to serious problems.

Without clear leadership and direction from the market strategy center, the R&D people waste time and money developing or extending products and technologies to irrelevant ends. They might also be engaged in research projects that are not aligned to relevant markets or corporate best interests. There is little value in funding R&D to support technologies that become little more than solutions looking for a problem that might not exist, simply because the proponents think the problem exists. It is an easy matter for a company to waste tremendous resources speculating on technologies and products, believing or hoping they are tomorrow's winners. People and companies often fall in love with their products while the market really doesn't care. As a result, most new product launches fail.

If there is a central, solid, market strategy, it seems the bridge to the R&D center is often missing or in the wrong place. There needs to be a good bridge so that disruptive technologies can be quickly recognized and successful strategic shifts made before it becomes too late. Not many managers currently recognize and properly assess potentially disruptive technologies. Fewer successfully make the strategic changes to prevent disruptions to their business. Technologies do not become disruptive if they are properly addressed and managed in a timely manner. A well-managed potentially-disruptive technology could become a normal sustaining technology. Without a good bridge, the R&D resources and capabilities are much less likely to be properly channeled or directed towards managing technological change opportunities. The General Electric Locomotive and Kodak examples demonstrate that good management can anticipate and take advantage of radical technological changes.

Companies should rationally apply R&D spending to where it has a positive impact on performance, in areas that lead to improvement of gross margins. This was confirmed in the 2005 Booz Allen Hamilton

study of the global top 1,000 R&D spenders. Sustaining technologies tend to fall into this category. Converting potentially disruptive technologies into sustaining technologies will lead to more predictable results from R&D spending.

In cases where there is a good match between a new offering and the market, a positive financial experience is a normal result. This seems quite obvious, yet it does not occur often enough. Among the top 1,000 R&D spenders, the Booz Allen Hamilton study found no correlation between R&D spending and performance except in the area of gross profit margin improvements. But those results were lost when considering overall measures of performance including sales growth, operating profit and shareholder return. A higher percentage of the new product launches need to succeed for the R&D costs to correlate to overall performance improvements.

The solution is simple enough. Arbitrarily dumping more money into R&D won't solve the problem. Companies should not approach new products and technologies speculatively. They need highly skilled and market-savvy people to consider new ventures with great clarity from the market perspective. They must avoid any temptation to pursue technologies or prepare product offerings that they do not know will be filling an actual or properly anticipated need. Those needs are not always obvious and the challenge is to develop ways to correctly determine them. This is difficult and requires tremendous skill.

The process of continually dumping large amounts of money into speculative R&D activity hasn't worked - especially when no credible marketing research efforts have been conducted. Neither has evaluating the various clever and interesting things that come from the labs while systematically and often arbitrarily deciding which ones to keep supporting, kill, shelve or start. The Booz Allen Hamilton study results confirm these true statements. Therefore it does not seem reasonable for R&D activity to be led by any decision-maker who is not within the core market strategy area. Nor should anyone leading the R&D activity have any type of inventoritis.

Some companies have been doing just fine in managing potentially disruptive technologies so long as they did not have serious unmanaged inventoritis issues. Managers do not need to blame innovation failures on externalities like “disruptive technologies.” They can look inwardly because, in fact, inventoritis is disruptive.

Chapter

4 Toyota vs. Ford Motor in “Lean vs. Mean”

Toyota has become the world's largest automobile manufacturing company this year, overtaking General Motors which reigned supreme since the 1930s. Before then, Ford was the global leader. Toyota must have been doing something right these past 20 years since it has also become widely known as the greatest manufacturer in the world. Furthermore, the company owns the newly created market in hybrid automobiles, with the Toyota Prius having become the symbol for hybrids.

The two main pillars of Toyota's approach commonly referred to as “lean manufacturing”, “Just-In-Time” or the “Toyota Way” boil down to:

1. Respect for people and
2. Continuous improvement - constant and never-ending improvement in all areas.

Toyota made a major innovation over American automobile manufacturers in the manner in which the company views its people. General Motors and Ford view factory workers as a replaceable variable cost component - labor as a commodity. Toyota views its workers as the main resource to turn to for productivity and quality improvements. Toyota further innovated by challenging the planned obsolescence approach

that was pioneered by General Motors in the 1950s. The company started producing cars with fewer defects that were more durable and would hold their value longer. American car companies were forced to respond in kind by producing longer lasting, better quality cars with greatly extended warranty packages.

This is not all that Toyota has done in terms of process innovations. American accounting methods valued inventory the same as cash, without any incentives for reducing inventory. Toyota pioneered “lean manufacturing” based in large part on creating value in the eyes of the customer and having products being “pull” or demand-based that would be responsive to the customer rather than “push” or supply-based from the production end. Lean manufacturing also includes identifying and minimizing then eliminating waste (including inventory), empowering employees and aiming for perfection in processes. This evolutionary change in the way cars are made is currently sweeping through other modern manufacturing sectors of the global economy.

As a result of these process improvements over the past 20 years, Toyota is now replacing General Motors as the world's largest automobile manufacturer. In 2005 and 2006, each had revenues of roughly $200 billion on which General Motors lost over $10 billion and Toyota made over $10 billion in profit in 2005. In 2006, the numbers were not quite as grim for General Motors with a much smaller loss of $2 billion. Toyota's numbers got even better though, posting almost a $12 billion profit in 2006, with a $19 billion profit expectation for 2007.

Ford Motor Company is in big trouble - with marketing shortfalls at the root of the company's current problems. Ford is not alone in this as Japanese automakers have also been slaughtering General Motors, the other remaining automaker based in Michigan. Chrysler was knocked out as an independent company when it was taken over by a German automaker in 1998. The Chrysler portion of DaimlerChrysler has since been an under performing operation and is currently up for sale.

Ford has lost touch with the market and, to avoid folding, needs to come up with attractive, well-priced, high-quality products that many people will be proud to own. Costs obviously need to be kept in line with this. The company should also consider working on its internal people

skills and perhaps revamp or replace the present caste system operating within. In short, Ford needs to overcome inventoritis while becoming more of a meritocracy.

Ford's sales dropped from $177 billion with a $2 billion profit in 2005, to $160 billion with a $12.6 billion loss in 2006. These are the highest losses the company has ever registered. Ford tried to buy its way out of its innovation shortfalls by spending $8 billion on R&D in 2005. That made Ford the world's largest R&D spender that year. Obviously, since it was spent by people with inventoritis, it wasn't going to make a big difference. At the same time, Toyota has been experiencing its best monthly sales performances ever. It was the world's 3rd largest R&D spender in 2005 at $7.2 billion with a much better return on its innovation investment. Toyota recently knocked Ford out of the No. 2 spot in the global automobile market and in the first quarter of 2007 overtook industry stalwart General Motors.

Japanese automakers Toyota, Honda and Nissan have been doing an outstanding job of increasing their shareholder value. At about $220 billion, Toyota's current market capitalization is over six times that of Ford and General Motors combined. Ford's present market capitalization is only about $16 billion, well below the cash value of the company. Ford stock has plummeted from $16 per share in 2003 to about $8 in early 2007 while Toyota shares tripled and Honda shares doubled in value.

Toyota's Humble Beginnings and Long Struggle

Toyota got its start in the 1930s producing knock-off or cloned versions of American automobiles. Company founder Kiichiro Toyoda went on a trip to the United States and to Henry Ford's plants in the 1930s. While there, he developed the manufacturing Just-In-Time inventory concept after observing how American supermarkets managed to keep their shelves minimally stocked and frequently replenished as customers purchased goods.

In the 1930s, Toyota produced few cars and several poor quality trucks of simple design. They only had one headlight and sometimes the body panels were hammered into shape over logs. During World War II, Toyota only produced trucks for the Imperial Army. For Toyota's first cars, completed in 1934, the engine design was a copy of the 65 horsepower Chevrolet straight-six cylinder engine and the chassis and gearbox was a knock-off version of the Chrysler Airflow.

Henry Ford's 1926 book 'Today and Tomorrow' was used extensively throughout the fledgling Toyota organization and Ford's massive River Rouge plant became a source of inspiration for Toyota leaders. The Japanese market was too small for the mass production approaches employed by Ford so Toyota began to seek approaches suitable for this much smaller market.

In December 1945, the U.S. military granted Toyota permission to produce automobiles for peacetime uses. At the same time, the U.S. government broke the Mitsui & Co. conglomerate, of which Toyota was a part, into small pieces. In the previous ten years or so, as part of Mitsui, Toyota had only produced a combined total of a couple thousand cars plus several army trucks.

In 1945, the U.S. War Department had an industrial training program for process improvement and employee development that was adopted by Toyota after it was abandoned in the U.S. that same year. Toyota leaders were able to build lean manufacturing around it and apply the principles of One-Piece-Flow and Just-In-Time to the company's impoverished situation. American manufacturers instead were focused on mass production methods that valued efficient high volume production above all else in the huge and expanding U.S. market.

Throughout the late 1940s and the 1950s, Toyota was a weak independent company, on the verge of bankruptcy much of the time. It could not afford to make large investments in equipment nor could it afford to build up inventories. The company had little choice but to operate in a lean manner and develop its processes under these conditions. It took several years for Mitsui to regroup, but Toyota was not reacquired as part of that. Toyota eventually developed into its own conglomerate, although with strong links to Mitsui. This is the way things stand today.

By 1955, Toyota was manufacturing 8,400 cars per year. A truck called the Land Cruiser was developed based on the designs of the early Bantam Jeep and Dodge half-ton weapons carrier, using the same knock-off version of the Chevrolet six-cylinder engine. Toyota's first luxury car, the Toyopet Crown, came out in 1955. So did the small 1-liter engine Corona that quickly became popular in Japan, with a production run of about 50,000 per month by 1964.

Toyota received an abrupt wake-up call from the U.S. market in 1958 when it first started selling cars there. The Toyopet Crown was a marketing dud that almost killed the company. Americans found it to be a heavy, boxy and severely underpowered car. This was to Toyota what the utter rejection of the vote-recording machine was to Edison - a stark warning that those who come to the market afflicted with inventoritis are bound to fail.

Like Edison, Toyota did not want to repeat the mistake of bringing a product to market without seeking to thoroughly understanding the market first. R&D and design operations from then onward were established in the target markets. As it turns out, unlike Edison, Toyota did not get it quite right and still produces a few flops such as the failed 1999 “Project Genesis” attempt to attract more younger U.S. buyers - a project that was killed in 2001. Toyota managed to build the Scion line from the Genesis work much as Edison directed his iron ore processing developments toward cement manufacturing. The MR2 mid-engine sports car product line launched with much fanfare in the 1980s was scheduled to be terminated in July 2007 in light of increased competition and lack of sales. These recent examples reveal that Toyota still has problems coming up with the right products for the right markets.

Toyota experienced a much more dramatic problem with the Corona that it introduced to the U.S. market in 1964, even though annual sales doubled yearly from 2,000 in 1964 to 300,000 in 1971. It was an inexpensive, small car that competed with the popular Volkswagen Beetle. Ford and other American producers were making mainly big, heavy and powerful cars and trucks at that time. Toyota also brought inexpensive, small trucks into the U.S. market by the late 1960s.

There was a huge downside to these vehicles that was not reflected in the rapid sales growth numbers. These inexpensive Japanese imports rusted very quickly and simply didn't last enough for people to get much use from them. Owners ended up spending numerous weekends attacking rusty Coronas with autobody fillers, sheet metal strips and replacement panels to get more life out of them. American cars were made of thicker metal so while they too rusted it took much longer for the doors to fall off or the seats to fall through the floors of these heavier built cars. Mechanical problems were more of an issue with the American cars since Japanese ones wouldn't last long enough to make it to the shop for mechanical repairs.

Toyota got the message in clear and no uncertain terms that people wanted cars that would last longer and prove more reliable. This message went deep into the organization which took on the challenge throughout the 1970s and into the 1980s, when the results of the extraordinary efforts began bearing fruit. American producers largely ignored the message.

In Japan, driving a car is more of a novelty than it is in North America where people more often drive out of necessity. There are few fast and long roads in Japan and congestion is often severe. A road trip can easily take five times as long to complete as an equivalent train trip. To gain relevant experience, Japanese engineers began making special trips to the markets where their cars were going to learn local conditions first hand. This helped them engineer major successful products for the U.S. market like the Camry, Corolla and Sienna. The Camry is currently the best selling sedan in the United States.

Things were going well until a different set of problems appeared. The yen became highly valued, forcing the company to attack its costs with greater vigor to be able to profitably sell into the Western markets while simultaneously dealing with a U.S. backlash against the large volumes of imports, mainly from Japan. Toyota attacked these problems directly and was working its way through them when Asian financial markets fell into a tailspin in the mid to late 1990s. This forced another round of belt-tightening and tweaking of the marketing strategy, with export markets being especially important. Quality setbacks became apparent as a result of aggressive cost-cutting and greater standardization of parts across various platforms.

Toyota came into the new millennium weary from many hard fought battles. The company had grown through hard work and many years of constant struggle in which it was able to develop its distinctive approach to manufacturing the high-quality automobiles that people since the 1980s have generally become proud to own and drive. Ford has been able to grow complacent over several decades since it never had to face such adversities as those addressed by Toyota.

Toyota's “Moving Forward” in Contrast with Ford's “Way Forward”

Ford's campaigns support the current view among consumers that the company is in serious trouble. The company is appealing to the buying public to help solve its problems. As heavy financial losses continue, senior managers are being criticized for stripping out large salaries and huge performance bonuses while penalizing the company workforce. Ford is closing 16 of its approximately 108 manufacturing plants and cutting 45,000 people from its approximately 300,000 person global work force as part of its “Way Forward” plan. Toyota has never had to layoff many of its workers throughout its history that has been marked by constant growth through struggle and various challenges and ordeals. Toyota has indeed been “Moving Forward” as per its slogan.

Ford's cost-cutting measures are important but will not save the company in the long run unless it can cost-effectively produce what are perceived to be winning products. It is difficult to have a product perceived as a winner while the core company is begging for mercy. Consumers have learned to not care about the company as much as about what value they get for their money, especially if they believe management is abusing its employees while robbing the treasury. This is now a widely-held belief.

Chairman William Clay Ford, Jr. has been bungling while trying to do things well. He is a man filling a very large pair of shoes, being the great-grandson of two industry giants, Henry Ford and Harvey Firestone. No one can choose his or her parents but individuals can influence their environment during their lifetimes - and sometimes

beyond that as Henry Ford appears able to do. Ford, Jr. has been taking a forward-thinking approach to the company his great-grandfather started a century ago.

Ford, Jr. is an avowed environmentalist and has been trying to move the company in that direction. Right or wrong, this has offended a large part of the customer base, especially traditional buyers of pickup trucks and muscle cars. He has also been trying to cut the number of U.S. Ford/Lincoln/Mercury dealerships, from about 4,300 currently, to bring it a little closer to the 1,200 Toyota has operating. This too offended several dealers. The massive job terminations and plant closings have support on Wall Street but obviously are of great concern to autoworkers and their families.

Ford, Jr. recently finished rebuilding the legendary River Rouge plant in Dearborn, Michigan, at a cost of $2 billion dollars, into a different kind of factory. Henry Ford's gigantic Rouge plant first opened in 1928, after a decade of construction. With its billowing smokestacks and almost unbearable working conditions, this was the world's largest and most complex integrated manufacturing operation. It employed over 100,000 people through the 1930s and was a great wonder of the industrial world, with people coming from all over to visit.

The newly renovated Rouge plant employs far fewer people, incorporates many leading environmental practices and has the fingerprints of Ford, Jr. all over it. The rebuilt factory has the world's largest grass covered roof, with the rooftop and surrounding grounds now reversing some pollution while supporting ecosystems. The Rouge smoke stacks are almost gone, birds and bees are returning, the assembly lanes are twice as wide as before and many ergonomic improvements have been made to increase productivity, worker safety, job satisfaction and product quality. This all seems reasonable.

Surprisingly, the new Rouge plant is still producing old Ford products, namely F150 pickup trucks, rather than a newer line of vehicles. The F150 is one of the company's longest running products, having been around for 60 years. Sales of F-series trucks have dropped a substantial 14% in the first quarter of 2007, following a steep decline in 2006. Instead of using this forward-thinking plant to produce newer products such as hybrids which Toyota is deriving an important part of its lead from, a big marketing opportunity has been missed. The media

did not make as big a deal of the new plant with its grassy roof as it might have done if the new concept for the manufacturing plant had been extended to the products rolling down its assembly lanes. People still come from all over the world to visit the Rouge plant but they leave carrying a mixed message.

Muddled messaging and an equally muddled marketing strategy is no good way to move a company forward. The actual marketing strategy could be encapsulated by the slogan “Wayward Ford.”

Ford could have appealed to the environmentally-sensitive customers without alienating the rest of its customer base, by defining its messaging much more clearly. Toyota does not appear to have a problem marketing big trucks and small hybrids to different customers in the U.S. without creating confusion. Although the messaging within each area is quite different, a buyer of a larger Toyota product does not appear to have a problem with doing that while being fully aware of the new hybrids at the other end of the product line. Ford did not produce a hybrid automobile until it was too late. The company put a traditional product line into an 'environmentally-friendly' type of factory which became an odd hybrid of sorts - offensive to many at both ends of the customer base.

Hybrid Opportunity

Japanese automakers took the lead in hybrid automobiles and got them into the driveways of many opinion leaders while American producers were putting out bigger versions of yesterday's winners - mainly fuel hogs. Ford saw potential in hybrids but did not make a move in that direction until four years after its competitors did. The company did however invest in hydrogen fuel cell technology and continues to do so. Unfortunately, this remains an overrated technology that has been long known by most serious engineers to be technically difficult, inefficient and expensive. Billions of dollars are currently being spent in the area in an attempt to overcome the laws of physics, chemistry and economics in producing a sound product. Toyota and Honda instead focused more of their efforts on proving the technical feasibility

of hybrid automotive technology and on making it commercially viable. This was recently accomplished and American automakers are now trying to catch up.

Ford failed to introduce hybrid automobiles to the market on time, claiming it didn't make sense because gasoline is less expensive than bottled water and sales of the larger vehicles were great. Within a decade, hybrids will represent a significant part of the massive U.S. market and Toyota is likely going to keep a substantial share of that. Toyota presently has over 50% of the U.S. hybrid market with Honda having another 30%. With a flurry of new models being announced, the domestic producers are fighting for a piece of the hybrid market but will have a hard time getting close to half of it. Honda actually got its first hybrid into production slightly ahead of Toyota although Toyota garnered most of the headlines for it.

The first Honda hybrid looked too futuristic and faddish whereas the Toyota Prius looked rather ordinary. It was easy enough for the average person to buy since it looked much like any other small car. People did not look out of place owning or driving a Prius. Honda realized its marketing error and soon came out with a more ordinary looking hybrid car, but not until Toyota had captured the main media coverage and most of the early market share for hybrids.

Toyota has pioneered its process for these unique hybrid automobiles that rely on a very high amount of electronic content. One of the great outcomes was becoming credited as the world's first mass producer of hybrid automobiles and quickly taking ownership of over half the world market for them. The Toyota process itself is a hybrid of best practices.

Toyota Keeps Worrying while Ford was Killed by Complacency

Toyota strives to not become complacent and has developed a reputation as always being worried about changes in the marketplace. This is based on its experiences in overcoming numerous difficult challenges over its 70-year lifetime.

On the other hand, Ford appears to ignore changes and fails to properly become aligned to meet upcoming needs by staying in tune with the market. Ford is not alone in this. Detroit automakers have been fooling themselves for decades while the Japanese were constantly deepening their understanding of the market and taking appropriate steps in exploiting opportunities that became available. It seems that becoming complacent is a natural tendency when there is lack of reason to do otherwise, as was the case for American producers. For many years, the domestic market was huge and expanding with American producers being in the middle of it. Most consumers were not very fussy or demanding, there was little or no real foreign competition and there were adequate resources available for domestic manufacturers to generally do as they pleased. They basically became fat and lazy. These manufacturers now find themselves almost unable to get off the couch and whip themselves into shape while lean foreign competitors are winning the important battles.

Although he seems like too nice a guy for the job, Ford, Jr. has been announcing plant closures and cutting huge numbers of jobs while seeking a way to pull the company out of its past. He also got out of the way recently and welcomed a new president and CEO in late 2006, while remaining in a possibly-conflicting leadership role as the company's Executive Chairman. The car business has long not been an American one, but Ford, Jr. and the rest of the Detroit elite still act as though it is. The trap has been sprung and Ford Motor Company is now being skinned while senior managers keep checking their expensive parachutes as they continue attacking members of their workforce. Many senior managers have recently left the company.

The main marketing blunder made by U.S. automakers was to become complacent while ignoring changing consumer preferences, and product cost and quality issues. Japanese automakers recognized a market need for well-priced products of consistent and constantly improving quality that were in line with consumer preferences. They outperformed the U.S. producers on this and have maintained an especially strong lead on product quality for about 20 years. The increased sales and market shares followed naturally. They have also been able to increase prices and profits during this time frame because of the higher perceived value of their products.

Ford produced considerable rhetoric on the issue of product quality, as it still does. But unlike Toyota, Ford failed to deliver on its promises. Japanese vehicles generally hold their resale values much better than American vehicles. American producers have been closing the quality gap although consumers have not yet become convinced.

Toyota and the other Japanese producers came out of virtually nowhere in taking over leadership of the global automobile manufacturing industry. They were widely perceived as producers of cheap, junky cars well into the 1980s when their quality trajectory crossed the bar that was kept low by American producers. German automakers have long relied on maintaining high product quality standards as part of their business model. It has served them well for many years as confirmed by a German producer having bought Chrysler, the smallest of the former American “Big Three” automakers.

Ford kept ignoring the wake-up calls and will likely suffer a similar fate to Chrysler or continue to wither unless things change dramatically. Ford's complacency has landed it in an intensive care ward. Hopefully, the company can avoid an imminent trip to the morgue.

The New Chinese Value Proposition

Another area that Ford and other American car manufacturers are falling down on is in regard to the potentially disruptive threat that low cost Chinese producers of cars like Geely and Chery bring to the U.S. auto market. The Chinese opportunity is a great one that will not become disruptive if handled in an inventoritis-free way. Ford never really got off the sofa and largely ignored the Japanese opportunity that became not only a threat but resulted in Japanese automakers led by Toyota becoming the dominant set of players in the U.S. and world markets.

It happened in the United States (again) in the mid-1980s when an unknown Korean producer came to the market with its Hyundai Pony and Excel models. These models were first introduced to the North American market in Canada where they quickly became a popular second car for commuters and shoppers, as they did in the U.S. soon

afterward. Again, these were inexpensive and inferior products compared to others on the market but there was a good market for them as affordable second cars.

Hyundai now enjoys 3% of the U.S. market. The company made major improvements in quality and claimed the top prize in the 2006 initial quality survey taken by J.D. Power and Associates. Hyundai was ranked the highest quality non-luxury brand of automobile. Toyota certainly took notice. It appears that Chinese manufacturers are following in the footsteps of the Japanese and Koreans. The Chinese marketing strategy might be initially represented with “buy one, get one free” as its slogan. If the pattern holds, tremendous quality improvements will come along in due course.

Geely is an interesting little Chinese company that produced about 100,000 cars in 2004, 4% of the Chinese domestic market. It ramped production up to about 200,000 cars in 2006 and is expecting to double or triple that within two to three years. It is the first privately-held Chinese automobile company and only started making cars in 1998. The company was founded in 1986 and started making refrigerators and then motorcycles, before getting into automobile production. The company introduces one or two new models each year and already has minivans and pickup trucks in production.

Geely has been very publicly announcing its intention to enter the U.S. market once it completes preparations. It was the first Chinese producer to come to the Detroit auto show, which it did in 2006, bragging about producing cars that will retail below $10,000 with at least a quarter of the selling price being for the dealers. It retails its current models in various countries, including its domestic market, for as little as $4,000. This should be of interest to consumers and competing producers alike.

The critics say the Geely cars are cheap, junky and unsafe which is partly true, but the same was said about both Japanese and Korean cars when they first came along. It took the Japanese about 40 years to develop their business, the Koreans 20 years, and the Chinese are doing it in close to 10 years.

Geely is a tier 2 Chinese automaker, one of a growing number, with labor costs at about $3.50 per hour versus over $35.00 per hour for American autoworkers. Overall, Chinese production costs for various industrial products are about 10 to 25% of those in the United States. That ratio will not likely hold for cars, but 20 to 50% might be achievable. This is a major cost differential and the Chinese labor pool is extremely large.

Chery is another tier 2 Chinese automaker that started recently. Chery was founded in 1997 and produced about 200,000 cars in 2005. It is likewise expressing its clear intention to enter the U.S. market.

Figure 1: The Geely "Beauty Leopard"[15] was introduced at the Frankfurt auto show in 2005, a year before Geely made its debut at the Detroit auto show. Is it an unsafe, cheap piece of Chinese junk that no American will buy, or is it a threat to Ford's business?

15. This Wikipedia and Wikipedia Commons image is from the user Chris 73 and is freely available at: http://tinyurl.com/2gknls under the creative commons cc-by-sa 2.5 license.

The tier 1 Chinese automakers like SAIC (Shanghai Automotive Industry Corporation) are so busy with their rapidly-expanding domestic markets that they haven't needed to look toward North America for sales of their brands. The tier 1 automakers are already producing cars in China that are of fairly good quality and these products, such as Ford's Europe-designed S-Max minivan, are starting to find their way into Western markets. Tier 1 Chinese automakers already have numerous joint venture arrangements with the major global automakers. The tier 2 automakers seem more interested in the U.S. market, partly because they are not as competitive and profitable in their own markets as they figure they would be in the Western market.

Toyota addressed these Chinese developments by recently building three new assembly plants and a powertrain factory in China whereas Ford recently built only one plant there as part of a Mazda joint venture. This is where the S-Max minivan will be produced. Ford also has a 30% interest in another Chinese plant it became involved with in the 1960s. Toyota is fully engaged with the Chinese market while Ford seems to be dithering in comparison.

Ford should not continue to downplay or ignore the Chinese opportunity until it becomes a threat like competing Japanese and Korean automakers did. Toyota has taken a very active interest in the Chinese market.

R&D Spending Successes?

No amount of environmental improvement from plant revitalization projects will save Ford if people lose interest in the company's products. What products are being produced is probably more important than where they are being made. The company needs to regain its touch with the market and customers. That requires the right type of leadership using the right knowledge and it comes at a price.

Ford has been paying the price, at least in terms of recent R&D investments. The company was the world's biggest R&D spender in 2005. There are some successes. The S-Max minivan SAV (Sports Activity Vehicle) seven passenger minivan developed by Ford of

Europe introduced in 2005 has become a hit. It is the 2007 'Car of the Year' in Europe. Similarly, in Canada, the recently rejuvenated Oakville, Ontario assembly plant now produces a new line of vehicles including the Ford Edge and Lincoln MK-X CUVs (Crossover Utility Vehicle) the company hopes will become great successes in North America and the 40 other countries where the models are being introduced.

Industry pundits remain skeptical these will become big enough hits to turn the company's fortunes around. Minivans and cars are not as important to Ford as the truck business, where there are substantial volumes and bigger margins. Profit margins on the Edge are too low and so are its expected volumes and that of its Lincoln sibling. These pundits claim the Ford new product pipeline is almost dry.

Ford has been trying to spend its way out of its problems. It will not work since there is too much inventoritis at Ford. R&D spending has been largely misdirected as has become evident from the lack of suitable products being introduced to the market in a timely way. Toyota spent less on R&D while achieving better results from it with winning products like the Prius hybrid.

Toyota's R&D spending, however, has not been a runaway success. It seems Toyota has squandered enormous resources on products like recent versions of the MR2 and hydrogen fuel cell technologies that reveal significant unresolved inventoritis issues there too.

Blaming the Unions

Many claim the unions and high costs of workers are a big part of the problem the American auto industry is experiencing and that these people are not actively involved in the solution. This view that they might be shooting themselves in the foot appears to be true. Ron Gettelfinger, current president of the United Auto Workers (UAW) union, has been reluctant to advance or discuss constructive solutions that could give American automakers a fresh competitive edge. It seems the UAW is struggling to keep afloat while a growing part of its

membership base is being left out in the cold as they become jobless. The recently-announced massive job cuts at Ford represent about a quarter of the company's U.S. workforce.

Like it or not, the unions are competing in a global marketplace, full of consumers looking for maximum value for their dollar. Most of these consumers care more about themselves and their own families than they care about the welfare of the average American union member and his or her family. There is a massive global realignment taking place and the unions are becoming powerless to do much about it. They would probably serve their membership better by finding ways to help create more new job opportunities for their members, than they would by continually resisting these changes. Supporting innovations to make American automakers and their autoworkers more globally competitive ought to be of great interest to the unions. The old model holds little or no value for unemployed members.

Unlike at Toyota, there is currently no bonafide partnership between labor and management at Ford. There are very clear lines drawn between the various layers in the Ford organization. A rigid and complex hierarchical system is in operation with high levels of distrust throughout the organization. Union and management relations tend to be confrontational. Much like in the days of Henry Ford, management and labor personnel generally do not mingle.

At Toyota, the front line workers are organized and decision-making works from the bottom up, rather than from the top down as at Ford. Toyota workers are all part of small teams of about four people, each one with a team leader. Similarly, groups containing about four of these teams are also led by a group leader. Executives are often found highly involved in solving problems on the plant floor and there are effective systems of communication. There is less evidence of the extremely demoralizing kiss up and kick down style of autocratic management found at Ford.

The improvement made in the way Toyota relates to its people at all levels within the organization is remarkable considering how regimented Japanese society is compared to American society. This is especially true now that the idea of Japanese companies and their employees being committed to lifelong relationships has been proven fictitious and counter-productive. The newer model is more realistic

with employees now demonstrating more active involvement in the wellbeing of the employer. Japanese society generally tends to be more regimented than in the U.S., but not as regimented as that at Ford Motor Company.

Toyota clearly looks to its people as the place to turn to for innovations and improvements, with everyone in the organization encouraged to participate. The UAW also represents some of Toyota's U.S. plant workers yet, compared to the U.S. automakers, Toyota seems to prefer fixing its problems - rather than fixing the blame for its problems on the unions.

It is not entirely clear where Ford turns to for its innovations. The company is spending vast amounts on its R&D, which has been failing to achieve its intended outcome in the face of the competition. Meanwhile, many of Ford's people are viewed as liabilities rather than assets. Viewed in this way, they are less likely to become willing participants in moving the company forward. Ford should do a much better job with its internal marketing - not just its external marketing.

Although few Toyota plants have unions, the New United Motor Manufacturing (NUMMI) joint venture plant between General Motors and Toyota that was opened 1984 in California is represented by the UAW. One of the worst U.S. workforces at General Motors was quickly transformed into one of the best through implementation of the “Toyota Way.” This suggests that management and company culture has a much greater influence on performance than unions and that, generally, unions are basically a reaction to traditional bad management practices dating from earlier times that exploit workers in manners perceived as unfair. Henry Ford himself learned this lesson at the Rouge plant where labor unrest brought about eventual unionization in spite of his active resistance.

The Paycheck Quandary

Ford, Jr. has forgone his salary and bonuses while his family company is losing money, although he still reportedly received over $6 million in compensation in 2006. Ford's new CEO, Allan Mulally was hired at an extremely high cost. For the four months he was with Ford in 2006, his

compensation package was allegedly worth about $34 million, with an additional $16.5 million possible for 2007. Part of the 2006 package was to buy out his Boeing compensation package. In sharp contrast, Toyota's CEO makes less than $1 million per year.

For 2005, the top 26 Toyota executives, including President Katsuaki Watanabe, were paid a combined $8.27 million, similar to the previous year. Japanese executives, much like German executives, typically earn about 10 to 12 times the amount that the average worker does, although they receive additional and often lavish fringe benefits that can be worth much more than their salaries. The U.S. system is radically different with some CEOs being compensated at a rate of about the equivalent of 500 to 600 workers, with just as many fringe benefits as the Japanese executives receive. This imbalance makes it increasingly difficult to motivate U.S. workers to contribute their best efforts and remain loyal to the companies that employ them.

For 2005, Toyota paid out $10,000 average bonuses to the workers in its Georgetown, Kentucky plant, while workers at Ford and General Motors plants received none.

There are all sorts of games being played with hiring practices that tend to come across as being underhanded. Incoming people are often retained indefinitely as part time employees while longtime employees are frequently downgraded or shuffled off to outside contractors where they can face big wage or benefits cuts and reduced working hours. Having numerous gatekeepers and guards posted at virtually every corner of the facilities, mainly to protect the company from its own people, certainly serves to help demoralize the workforce. This is done at Toyota and Ford plants alike although to a much greater extent at Ford than at Toyota.

The managers at U.S. automakers keep giving themselves big bonus checks during downturns, while workers get left out and are often sent home during such bad times, further reducing worker morale and reinforcing the “us versus them” mentality. This is certainly not fertile soil for receiving or planting innovative ideas and allowing them to grow. People at lower levels tend to find their ideas stifled by those above them and, conversely, they become resistant to changes or innovations imposed from above. The aforementioned 'kiss up and kick down' mentality is part of this.

Put simply, for Ford to regain a leadership position, it must overcome inventoritis and become a better marketing organization than the others in the car making business. This will not be easy. Toyota earned its lead using an almost inventoritis-free approach. The company will not give up this hard-earned lead willingly and certainly will not lose it to a company like Ford that is plagued with inventoritis.

Chapter

5 Lessons from Toyota vs. Ford

Have an inventoritis-free company by ensuring the people within it are largely inventoritis-free. This is an important lesson from the competition between Toyota and Ford. The “Toyota Way” is much better aligned to overcoming inventoritis than is Ford's more traditional approach to manufacturing.

The Toyota Production System (TPS) Weeds Out Inventoritis

The Toyota Production System (TPS) works as a complete philosophy. It is a consistent set of processes and principles applied over a long period of time. The following principles form the core of the highly effective TPS that greatly enhances productivity. These “lean” methods serve to reduce inventoritis and its downsides just as a vegan diet reduces obesity and premature death.

- Create manual systems first, then use technology as a tool to assist the process. Toyota people are often found making signs

and putting them up all over the place and using them along with manual lists and colored bins rather than using electronic systems to coordinate activities. An empty red bin on a production line is a clearer indication of a shortage of a key component than an indication on a computer screen would be. Similarly, manual production processes are worked out before considering them for automation. Once the manual system is worked out, then technology is brought in to assist and improve the process. There is a strong aversion to acquiring and using technology just for the sake of the technology.

- Create an environment where constant learning occurs. Toyota is full of people who strive to be teachable and who are very willing to share information and be involved in the learning process. Learning by doing is emphasized over theoretical learning. People are encouraged to go directly to where the problem is and work out solutions at the source wherever possible. This can only occur where there is respect for people. All personnel at Toyota are actively encouraged to participate in the process. It is based on a climate of mutual understanding and trust among all team members. Creating a “learning organization” is a key goal and seeking a thorough understanding is required in all relevant areas.

- Eliminate - don't just reduce waste. In the U.S. system, the production line has slack built into it so that there is extra time and production line materials and resources available to ensure that the line stays running. In the Toyota system, there generally is not.

- Build quality into everything. Standardizing to create consistent quality while constantly working to raise the standards. Anything worth doing is worth doing well. Toyota aims for “great” rather than just “good enough” wherever there is opportunity to do so. Operational excellence has become a strategic weapon for Toyota. Just-In-Time and One-Piece-Flow are among the tools used to build operational excellence.

- Create systems to respect and treat partners well. Self-improvement toward increased personal productivity is a two way street. Toyota's people work on self improvement but consider that to be tied to helping others improve - for mutual benefit. This works the same way for suppliers as for individual employees.

- Work with others but maintain core competencies. Do not outsource the important decisions. For Toyota's cars, electronics has become a big part so the company has decided to make that a core area.

- Choose friends and associates carefully. Toyota is very picky. Employees are often hired through a one to two year process. Partners and suppliers similarly go through extensive processes.

- Reduce the timeline from the time the customer places the order until when cash is paid for the product. Any excess time is considered waste. One-Piece-Flow and a “pull” system that works back from the customer needs in each step of the process is essential. The product must flow through value-added processes with minimal interruption and waste. The term “customer” in the TPS system includes the buyers of the products and also the internal consumer in any part of the value chain of converting raw materials into finished goods.

- Stop the machinery to fix problems and to avoid overproduction.

- Level the production schedule as much as possible by building some inventories of finished goods. This is not the same as running up production inventories. It includes carefully managing the marketing program to minimize costly fluctuations in volumes.

- Standardize tasks while emphasizing long term over short term.

Toyota learned these methods through 70 years of experience and they have become the latest fad in manufacturing circles. In and of themselves, none of these are particularly unusual or original. What makes them great is that they are part of a complete system or philosophy of manufacturing. Reduced inventoritis is a natural by-product of the TPS.

Innovation vs. Standardization

An important topic that receives little mention outside engineering circles is the subject of determining how much one should innovate versus standardize products and tasks. This had wide implications in many areas and both Toyota and Ford have dealt with it explicitly, albeit sub-optimally. Innovation and standardization are not conflicting ideas if handled in an inventoritis-free way. In fact, appropriate standardization is itself a form of innovation because, while reducing costs is a main driver of standardization, increased interoperability, quality, consistency, user-friendliness and usability for a larger number of customers over a larger market or geographic region are normal results.

Toyota has the goal of standardization of tasks as one of the key aspects of lean manufacturing. But the company seems to have problems determining how much emphasis this should receive or to what extent this should be done. It seems that Toyota went too far in standardizing parts across various platforms in the mid to late 1990s and is still working through the resultant quality problems. Henry Ford himself went overboard in refusing to innovate his Model T automobile designs, styles and colors as exemplified by his famous quip “You can have whatever color you want as long as it's black.” Henry Ford's stubbornness caused him to concede Ford's dominant market share to Alfred Sloan's General Motors. These examples from Toyota and Ford, and the consequences, reveal just how important the topic is.

The answer for how much one should standardize is actually quite plain and simple: standardize as much as is practical as long as the customer derives greater value from the standardization than from a competing innovation. The key is to know and not just assume what the customer values and being able to correctly determine the value. Determining this standardization target point becomes almost impossible to do for people and companies afflicted with inventoritis.

Toyota was able to manage its standardization program much better than did Henry Ford who lost a big chunk of market share. In recent years, Ford Motor seems to have fallen into the same trap as its founder - overdoing the standardization. The company failed to bring out hybrid automobiles and continues to crank out overly standard

products in the face of competing innovations. This is a sad outcome of Ford's collective inventoritis condition. Toyota is unlikely to make that mistake so long as its process remains somewhat inventoritis-free.

The Inventoritis-free Way Forward

Many manufacturing companies start out making goods to fill custom orders. Toyota got its start mainly making simple army trucks while it was part of the pre-war Mitsui conglomerate. It is generally not difficult to manufacture something based on a specific purchase order and specification. Inventoritis starts creeping in when custom manufacturers start seeing what they believe are good opportunities to take something they have been custom manufacturing as having a wider market appeal. Many of them start becoming more inwardly focused than they were when they were filling purchase orders for specific customers. Software companies frequently fall into this inventoritis trap.

Custom producers lose sight of the fact that they need to understand the market as well as they understood their specific customer while they were delivering certain quantities made to a customer specification. When marketing to a more generic customer base that is often simply called the “market”, matters become fuzzy for such unprepared manufacturers. So, instead of clarifying the market, they turn inward and develop products they like but which may have no market at all. This is because the company does not have systems to determine what the “purchase order” or “customer” is in the generic “market.” The company itself ends up becoming the customer.

Henry Ford understood the market very well when he invented his Model T, a low cost car that was affordable to the masses. Ford clung to this too long after the market was changing. In later decades, Ford had enough product hits like the Model A, Mustang, Escort and Explorer that it held a strong position in the global automobile market.

Toyota took a different approach in recent years. Instead of producing standard cars for the market, the company learned how to produce cars to specific order. Anyone who orders a Toyota can specify various options, colors, etc. and this custom specification gets converted into

a somewhat custom automobile for them. It is hard to see where Toyota can go wrong making specific products to specific customer orders so long as it can control its costs. Toyota is striving to become the ultimate custom manufacturer, making every one of its products to fill a specific customer order and agreed upon specification.

The Toyota Production System (TPS) works in reverse to overcome inventoritis by systematically eliminating waste caused by this industrial disease. By carefully examining the waste and looking for causes to correct, many aspects caused by inventoritis become treated. It does not, however, approach it in an optimum way as evidenced by Toyota still putting out products - such as the U.S. Crown, Corona and MR2 - that did not achieve intended long term outcomes.

It is essential to identify and treat the people within an organization, as the TPS does somewhat, and then train the organization to self-treat this condition which will keep creeping in if unchecked. By having people be vigilant and free of inventoritis, the innovation process can be simplified, streamlined and thus improved with better results overall. Results can be measured by looking at the numbers and magnitudes of commercial successes relative to investments in these areas. An inventoritis-free approach to development of a marketing strategy can revolutionize manufacturing and technology development as it is doing for Toyota and has done for Edison in his day.

Chapter

6 Innovation Audit: 3M, HP and Procter & Gamble

In 2005, Booz Allen Hamilton released the results of a study[16] of the global top 1,000 R&D spenders. This is the most comprehensive study conducted to date in regard to assessing the correlation of R&D investment to corporate performance. Their main conclusion was striking; dispelling the old myth that higher R&D spending translates to a competitive advantage. The researchers found no direct correlation between R&D spending and sales growth, operating profit or shareholder return.

"Innovation" has become a buzzword of such extreme that 3M recently made its corporate slogan "3M Innovation" and Hewlett-Packard similarly has chosen "HP Invent" as its latest slogan. Vast amounts of money are spent in this area and many companies still pride themselves on the money they spend each year on R&D activities. Some companies apply over 20% of their gross sales revenues toward R&D.

16. Jaruzelski, B., Dehoff, K., & Bordia, R. (2005). The Booz Allen Hamilton global innovation 1000: Money isn't everything. Strategy + business magazine issue 41, Winter 2005 Reprint No. 05406. New York: Booz Allen Hamilton.

There is a high concentration of R&D spending. About a quarter of the $380 billion spent in 2004 or $410 billion spent in 2005 by the top 1,000 R&D spenders represented the top 20 companies and the top 100 represented two-thirds of the total. The biggest spenders are in the automotive, health and technology fields. The Booz Allen Hamilton researchers estimated the Global 1000 list captured between 80 and 90% of all corporate R&D spending and over half of total global R&D including that conducted by governments and not-for-profit organizations.

Company managers and owners saw value in organizing and supporting industrial research laboratories based on Thomas Edison's successful Menlo Park model. But these corporate leaders did not carefully examine the original marketing purposes and concepts behind Edison's model. Regrettably, companies have since struggled with the issue of how to effectively manage corporate research and development efforts. The issue has always been controversial.

In Edison's day, AT&T (Bell Telephone), partly as a result of its deal with the United States government in exchange for a telephone monopoly, was quick to establish Bell Labs. It grew into a huge organization with over 8,000 employees at its peak. It is now owned by Lucent Technologies as a result of the recent reorganization of AT&T, and is being scaled down.

Xerox later established the famous PARC (Palo Alto Research Center) and some important new discoveries and technologies came from there. PARC did not however, provide many products benefiting the Xerox shareholders who paid for it. The shareholders of Microsoft and Apple, instead of those at Xerox, reaped the benefits of the home computer industry built from technologies developed at PARC.

Most big companies are actively building up their R&D operations. Some are shrinking, selling or closing theirs while a few others avoid them altogether and contract out any needed R&D services. In each of these cases, an endless stream of winning products is not the normal result. However, Menlo Park and the successor operations established and run by Edison, did produce a long and uninterrupted stream of winning products. This was no doubt a result of Edison's inventoritis-free, market-savvy perspective.

After Edison's successful and organized marketing-led R&D operations, there has never been a clear solution to the lingering problem of justifying R&D centers. How does a company cost-effectively generate a consistent stream of excellent products through managing and supporting these corporate centers? The development and testing activities modeled on Edison's Menlo Park example have been operated under the premise that establishing systems and processes to developing winning products through technical research and development activities, gives the company a competitive advantage. Ever since Menlo Park, modern R&D centers have sprouted up all over the industrial landscape where they remain a prominent feature for many large companies. These companies have guarded and protected their financial stake in them, whether or not they are cost-effective.

R&D centers tend to be spacious facilities, located in quiet, secluded areas, often far away from the factories producing the products and the offices from which the sales and marketing people operate. These facilities often feature pleasant natural surroundings with nice views, fancy water features, lavish green spaces, big parking lots, and well equipped laboratories and host a diverse mix of people with different technical specializations. Many scientists and engineers are employed in these numerous industrial R&D centers, with the largest centers employing thousands. These comfortable places might look like a natural outgrowth of Edison's Menlo Park but upon closer examination have little resemblance to what his laboratory was really about; a facility that was to serve his clearly-defined marketing objectives.

People working in corporate R&D centers usually have limited knowledge of the business of the company beyond where it involves their often narrow specialties. Few of them truly understand or care about the marketing strategy of the company. It is likely that almost none of them are actively engaged in developing or deploying an effective marketing strategy. Company CEOs, upper management teams and owners generally assume these expensive centers which form a normal part of the industrial landscape are serving the corporate best interests. They accept the high costs of corporate R&D as one of the required costs of doing business.

How Innovative is 3M?

3M is a century-old company that has done a tremendous job of establishing its reputation as one of the world's most innovative companies. Founded in 1902 as the Minnesota Mining and Manufacturing Company by five businessmen, 3M started out mining and manufacturing grit used to make grinding wheels and sandpaper. In 1925, the company invented masking tape and has since become the world leader in producing 'sticky' products including Scotch Tape and the extremely popular pads of Post-it Notes that were first introduced to the market in 1980 and can now be found in virtually any office environment. Audio tapes and Scotchgard fabric protective sprays are among its many non-adhesive products. In 2005, 3M was ranked by BusinessWeek[17] as second among the world's most innovative companies, and it was named first the previous year and third the following year.

In 2006, 3M spent 6.5% or $1.5 billion of its $22.9 billion in revenue on R&D, well above the typical rate for industrial manufacturers. The company has almost 10,000 personnel working in the R&D area. About 20% of its R&D spending is directed toward basic research and pursuits not tied to practical outcomes. Traditionally, researchers at 3M could also apply 15% of their time to discretionary projects of their own choosing.

The company currently has leading expertise in about 40 diverse technologies and strongly encourages internal networking so that ideas are readily exchanged among its researchers. A formal annual symposium called the “Technical Forum” invites all of the company's R&D people to get together and share their work. Additional conferences and online forums are organized among various 3M labs to facilitate constructive networking.

3M has various ways to assess how well R&D money is being spent relative to objectives and it has well established systems for rewarding employees for outstanding scientific and business achievements. People at 3M pride themselves on being world leaders in converting

17. Jaruzelski, B., Dehoff, K., & Bordia, R. (2005). The Booz Allen Hamilton global innovation 1000: Money isn't everything. Strategy + business magazine issue 41, Winter 2005 Reprint No. 05406. New York: Booz Allen Hamilton.

scientific discoveries into commercial products. There can be no doubt that the company takes innovation seriously, as suggested by the high level of R&D spending in support of its '3M Innovation' slogan.

William McKnight was 3M's inspirational leader from 1929 to 1966. He is well known to company insiders for having created a corporate culture that encourages employee initiative, innovation and risk-taking while discouraging management from telling employees with authority how they must do their jobs or being destructively critical when they make mistakes. The culture McKnight instilled remains a core part of the company's traditions.

The story of the invention and development of 3M's highly popular note pads composed of sticky sheets called “Post-it Notes” suggests a more sluggish approach to the company's innovations. The official story is that Post-it Notes were developed from 1974 through 1980, after which it became a commercial product that has since grown into a major product line for 3M. Today, there are over 600 Post-it products sold in over 100 countries. The details of the development reveal some problems in 3M's innovation process. Without the determination of both Art Fry, the inventor of the Post-it Notes, and Spencer Silver, the inventor of the special adhesive, the products never would have come to fruition. There were a couple points at which Post-it Notes were killed by 3M corporate processes and the product surely would have died had Fry and Spencer not been more tenacious marketers than typical scientists and engineers.

In the early 1950s, Art Fry, a chemical engineering student, took a job during two summers selling housewares door-to-door. During his final summer break, he worked as an intern for 3M and joined the company after graduation. He participated in hundreds of projects at 3M over the next 20 years. Only a small percentage of 3M's projects ever develop into commercial products. In Fry's experience, of the hundreds of projects he was involved with, only about 20 made it to market. With his experience in both the technical and sales areas, plus his substantial experience in the process of nurturing 3M products from ideation to commercialization, Fry would not have been likely to have any inventoritis issues prior to inventing the Post-it Notes for which he became famous.

The story of the Post-it notes began not with Fry, but with 3M chemist Spencer Silver who had developed a new type of adhesive that was sticky enough to hold a sheet but loose enough to allow a sheet to be peeled back without tearing or leaving a residue. Silver discovered this type of adhesive in 1968. He was a passionate advocate of this new type of adhesive, promoting it for years at every in-house seminar or forum where he was able to book a presentation. Fry learned about Silver and the adhesive through a golfing partner at 3M's private golf course. Fry eventually attended one of Silver's presentations. Nothing came out of it directly since Fry did not initially see a practical use for the adhesive.

Years later, in 1974, while Fry was singing in his church choir and having problems with his hymnal bookmarks falling out and causing him to lose his place, he visualized a lightly adhesive bookmark and remembered Silver's work.

Things immediately became difficult for Fry as he tried determining a market for his sticky bookmarks. He made samples using a portion of his working hours under the “bootlegging” policy that allowed up to 15% of a researcher's time to be used on a project of his or her own choosing. He started passing handmade samples of these bookmarks out to 3M secretaries, librarians and his lab cohorts but found they did not consume them rapidly since they were reusable.

Then he hit upon an idea and wrote a note on one of the sticky bookmarks pointing to some data in a report, and passed it on to his supervisor Bob Molenda - who wrote a reply on the note and sent it back to Fry. The product idea had transcended from simply being a better bookmark to becoming a sticky note. This exchange was a unique form of communication that became the basis for a high volume consumable product. The sticky notes quickly became popular at 3M offices, with the product being viral in nature as people showed them to each other and came to Fry asking for more.

Molenda allowed Fry to charge expenses to miscellaneous accounts although the project had not become official. Fry was able to work on the project when he had time after completing his official assignments. He was eventually allowed to organize a small team to consider turning the notes into a commercial product. But there was little interest and support for the project due to strong institutional biases. The people in

the tape division were not familiar with the idea of any product that was not on a roll or that used a “second-rate” adhesive. Pat Gaudio Edwards was a fairly junior person who was given the assignment to be the Post-it Notes marketing coordinator, mainly because no one else wanted the job.

The engineering and production people killed the project since they were not able or willing to develop a prototype production machine to produce the pads. Fry built a prototype machine at home in his basement and later had to remove the door and part of a wall to get the machine out of his basement and onto a truck for delivery to 3M. The engineers then worked on some improvement modifications to enable the machine to produce sufficient quantities of commercial quality product to run some types of market testing, such as a focus group.

The focus group testing produced some enthusiasm albeit with strong price objections since participants did not see enough value in the product as a communication tool to justify its high price relative to conventional note pads. In 1977, the product was test marketed in four cities with two being complete failures and the other two generating mediocre results. There was little support for the product. Like the engineers before them, the marketers now killed the project.

Fry kept at it and a couple of 3M executives, Geoff Nicholson and Joe Ramey ran their own single-day test marketing exercise in Richmond, Virginia, one of the earlier test market cities. They cold-called various offices, demonstrated the product and received enthusiastic responses from the demonstrations. Ramey decided to go for one more test trial, focusing in 1978 on a single city with a population of less than a quarter million people - Boise, Idaho.

The “Boise Blitz” campaign included a solid media and press program to get the product story out: the products were brought to many offices throughout the city, numerous banner ads and point-of-purchase displays were placed at retailers and thousands of samples were sent out to purchasing agents, office managers, lawyers, doctors and administrators. An army of personnel went out to demonstrate the product to potential customers. The campaign was a huge success that resulted in 3M deciding to give the product a commercial launch.

The product continued to host many skeptics including distributors and retailers who saw the high pricing relative to conventional note pads as being a problem. Additionally, 3M executives made it harder for people to understand the product because they refused to let them be named “Sticky Notes” which is what most people ended up calling them anyway. The argument was they already had a “Post-it” bulletin board product and the sales of one would help the other. Eventually the “Post-it” name stuck and the eventual success of the sticky notes developed the Post-it branding that now covers several 3M products.

Three years later, in 1981, the product recorded over $2 million in sales. That increased to about $45 million in 1983 and around $1 billion in 1998. Fry was promoted to division scientist in 1984, then corporate scientist in 1986, the top rung of 3M's technical ladder. There was no special financial compensation, although Fry has been a highly sought-after speaker on the topic of innovation since then. The product has been featured in numerous top consumer products lists throughout the 1990s.

The Post-It Notes story reveals both sides of the 3M innovation coin. The culture of innovation was sufficiently nurturing for the product to have the opportunity to succeed. The flip side is that without Fry's tenacity or keen sense for market potential or Silver's persistence, the project would have been doomed. It never would have made it past the prototype engineering or the first round marketing trials. Nothing would have happened if Fry had not been competent and determined enough to build the machine in his own basement at home, press onward with the marketing trials and persevere in navigating through the myriad intricacies of the 3M bureaucracy.

Fry was fortunately a person free of inventoritis who had the leadership, marketing, sales and technical abilities required to make the project succeed. While 3M must have surely considered how its systems, which they laud for their innovative genius, repeatedly killed what has become a very important product, Fry's example has nonetheless inspired many people - including those at 3M. The way he took initiative along with risk while bringing the Post-It innovation to great success exemplifies how William McKnight's early vision for 3M was innovative - but the carrying out of it by Fry in the 1980's was

accomplished not with corporate practices, but with an individual leader's inventoritis-free, technically-competent, marketing persistence.

How Well is HP Inventing?

Hewlett-Packard, or HP, is a company that was founded in 1939 and that had grown large while its cofounders lived. Electrical engineers Bill Hewlett and Dave Packard founded the company five years after graduating from Stanford University. They started the company in a small single-car garage in Palo Alto, California. This is where they began producing engineering instruments beginning with the first commercial product, the 200A audio oscillator. Over the next 40 years, this engineering-driven company grew steadily. It developed a reputation for producing robust and highly usable signal generators, voltmeters, oscilloscopes, frequency counters, thermometers, calculators and other engineering test equipment of sound ergonomic design. These instruments almost always had greater ranges, more functionality and greater accuracy than competing products. By 1980, HP had grown into a $3 billion a year company. It was in a great position for growth as the computer industry was about to go supersonic.

It would be hard to find any engineers working in the 1970s or 80s who did not own or operate one or more HP products. HP produced the world's first scientific handheld calculator, the HP-35, introduced in 1972. This was followed by later models leading to the first alphanumeric programmable HP-41C. These innovative products led the rapid wholesale switch from manual slide rules to electronic calculators for engineers.

HP maintained its lead by introducing the HP-65 in 1974, arguably the world's first handheld computer. In 1977, the HP-01 wrist instrument known as the “cricket” was introduced. This electronic device was a combination wristwatch, calculator and calendar that was far more sophisticated than most competing calculators. The “cricket” was a masterpiece of miniaturization, albeit a marketing and fashion dud. It

was apparently the world's first “personal digital assistant”, more commonly known as a PDA, of which there are many types in use now, some 30 years later.

HP held the lead in the engineering tools area and had great momentum going into the 1980s when it introduced its first official handheld computer, the HP-75C. Among the world's engineers, this was another popular item along with the various newer models of electronic test equipment. Non-engineers also came into contact with excellent HP products such as the extremely popular HP-12C financial calculator introduced in 1981 that remains in production today, more than 25 years later. Engineers generally regarded HP as the world's best when it came to inventing and producing tools used in their trade or profession.

So what did HP do to grow to 30 times its size from $3 billion in 1980 to $91.7 billion in revenue in 2006? It edged past IBM at $91.4 billion, and by doing so just became the world's largest technology supplier. HP also went into 2007 as the world's largest company in terms of worldwide computer shipments. It surpassed arch rival Dell and widened the gap between them. HP took a 3.5% market share lead at the end of 2006. The answer lies in innovation and appropriate responses to the changing marketplace.

Going into the 1980s, HP's engineering culture was widely known both inside and outside the company. A very large part of the world engineering community was using HP products and the HP founders were widely known for their approach to business. These included the “HP Way”, in which authority was pushed down as far as possible into the organization (not entirely unlike the “Toyota Way”).

Bill Hewlett described the HP Way as a core ideology that “includes a deep respect for the individual, a dedication to affordable quality and reliability, a commitment to community responsibility, and a view that the company exists to make technical contributions for the advancement and welfare of humanity.” In 1995, Dave Packard published The HP Way retelling the HP story and providing further insight into the culture, strategies and approaches that led to HP's success. For example, throughout the 1970s within the engineering

customer base, the dominating strategy inside the company for designing products was summarized with the widely known slogan “design for the guy at the next bench.”

In 1966, HP Laboratories was established and began as one of the world's leading R&D centers. The initial areas of research were solid state physics, electronics and medical and chemical electronic instruments. Richard Lampman joined HP Labs in 1981 after a decade in HP's measurement and computing businesses. He became a director of HP Labs in 1992 and became HP's Senior Vice President of Research. He has been Director of HP Labs since then.

Lampman and current HP Chairman and CEO Mark Hurd, in January 2007, claimed that HP Labs' job is to be “ahead of the road map” with business units having responsibility for their respective products and services. Each business unit has its own development programs and a road map of products for the future. The job of the labs is to “look beyond that to understand technology changes, competitive information, emerging customer needs and industry shifts.” The labs are employed as a strategic weapon to help the company “think ahead to what kind of technology options HP will want in the future, both for businesses we're in and for new opportunities that could expand the company.” This appears to be a sound and somewhat inventoritis-free approach to running an R&D operation.

The labs' activities are currently tied to the company's marketing strategy through an Executive Vice President and Chief Strategy Officer, whose staff includes the HP Labs and the chief technology officers for each of the company's main businesses. It seems that unlike many other companies, HP has its R&D center well tied to its overall marketing strategy.

It is the engineering-friendly culture set against the backdrop of dramatic innovation in electronics that created fertile ground for the genesis of the computer industry. Stanford University engineering graduates stayed in the valley rather than head east as had been the normal practice. HP became an important part of the 'Silicon Valley' core as it remains today. Steve Jobs and Steve Wozniak, cofounders of Apple and inventors of the personal computer, both worked for HP.

Wozniak offered HP the first opportunity to commercialize his first computer creation. HP didn't go for it, so he and Jobs went out and started Apple in a garage of their own. But HP didn't get left out of the computer business. It presently sells millions more computers per year than Apple or anyone else.

The company did something phenomenal when it invented the inkjet printer while it was at the same time developing laser printers - both for use with personal computers as well as for larger systems. It would be hard to imagine a better example of synchronizing the right products for the right markets at the right time. This was an amazing feat of innovation that hit the market strong and fast in the early 1980s. Sales of printers and supplies remain one of HP's core businesses.

The HP LaserJet printer that was introduced in 1984 was the world's first mass market laser printer. It employed print engines developed by Canon. This printer came out at a perfect time, just before desktop publishing came into existence. Likewise, the HP ThinkJet printer was developed and brought onto the market in 1984, the same time as the LaserJet. The inkjet technology was invented at HP laboratories in 1979. The laser and inkjet printers each came with disposable cartridges which became a high volume consumable product with great margins.

Laser printing technology was originally developed by Xerox beginning in 1971 and eventually became a multi-billion dollar business for Xerox, selling to commercial and industrial clients. HP was the first to make the laser printer technology available to the mass market and quickly became the market leader. The company has held a solid position ever since, in spite of there now being a great deal of competition in the area. The tremendous growth and size of HP's printer and replacement cartridge business for both laser and inkjet product lines made it a huge cash cow for HP through the 1980s and 1990s.

HP's printers were quickly and widely accepted, based on the reputation of excellent product quality and value that HP had earned prior to entering the printer business. The products matched customer expectations well since these machines soon proved to be quite durable. People were often replacing their computers, and these peripheral printers were well matched to users' evolving needs. Customers could choose to buy the more expensive laser printers and

use them with successive computers for several years or buy less expensive printers as part of each successive system. There was something for everyone, and HP was able to meet the demand with well-priced products.

HP's printer business had the advantage of generally being a product category with longer product life cycles than personal computers. Product life cycles were an issue for HP that became apparent back in the 1950s. An internal study showed four to five years being the typical duration for which the company had a technical advantage. This study placed a high emphasis on the importance of the company's innovations.

Since the 1950s, life cycles of business products have in general become much shorter, being measured nowadays in months rather than years. In HP's case, it makes 75% of its revenue from products introduced within the past two years.

The printer business was a cash cow that has been able to keep the company on a fairly even keel during the turbulent past two decades in the technology industry where the clock is marked in nanoseconds. The swings are large and the stakes are high, as the recent industry boom and bust cycle revealed.

There has been a lot of criticism of HP not living up to its “HP Invent” slogan that was adopted soon after new CEO Carly Fiorina took over leadership of the company in 1999. The company went into an acquisition mode, buying its then computer arch rival Compaq, moving toward simplicity rather than innovation. It was also moving away from microprocessors and semiconductors although still actively pursuing molecular and quantum computing. HP spun off its original measurement, components, chemical analysis and medical businesses into Agilent Technologies while retaining its computing, printing and imaging businesses. HP retained 84% of the Agilent common stock.

Fiorina produced a few good quarters after the Compaq merger but millions of shareholders did not fare well, unlike shareholders of competitors Dell and IBM who achieved much greater investment returns. She also cut numerous jobs while causing many remaining

employees to become unhappy with her for having led the company away from the “HP Way”, by centralizing control and by eroding the traditional collegial atmosphere.

Fiorina was replaced in 2005 by Mark Hurd who successfully managed to complete a difficult job of trying to “better align marketing with sales - targeting investments” while keeping HP in its new place as the world's leading IT company. Hurd did an amazing job, surpassing IBM in sales.

HP has been cutting back on its R&D spending as a percentage of sales while boosting productivity in the innovation area over the past 10 to 20 years. The $3.5 billion in R&D spending in each of 2004 and 2005 represented about 4% of total sales revenues. That was about half that spent on average by technology companies in those years and substantially down from the 10% of revenues HP applied to R&D in the early 1990s. Notwithstanding the recent relative reductions in R&D spending, the company has done fairly well in applying R&D efforts on margin-improving technologies for various businesses. This was done while developing key technologies that are fundamental in the creation of chemically assembled electronic nanocomputers, expected to become the next generation computing technology. It seems that the company's performance, as suggested or expected by the 2005 Booz Allen Hamilton study results, indeed does not correlate with its R&D spending.

The number of patents a company receives can be used as a measure of innovation activity. As discussed in Chapter 2, this is not necessarily a good measure. HP made a big deal of obtaining patents in recent years, having jumped from 9th place in 2002 with 1,385 United States patents to 5th place the following year with 1,759 US patents. HP moved to 4th spot in 2004 and then to 3rd spot in 2005 at 1,797 US patents. IBM remained in first place as it has for the past 13 years. HP has done well in terms of innovation productivity, if the number of issued patents can be deemed a useful measure of a company's innovation activity.

HP employees are encouraged to come up with patentable ideas. Each written proposal for an invention in 2002 gained the employee $175 and an additional $1,750 if HP decided to apply for a patent on the basis of the proposal. IBM has taken this even further. IBM employees

have incentives going to as much as $100,000 per invention. With this type of incentive in place, there is a tendency toward patenting junk or creating narrowly-defined patents that are of little or no commercial value. Costing somewhere between $5,000 and $20,000 each for a typical U.S. patent, this has become an expensive way for HP to try to claim bragging rights against IBM. IBM's approach is not much better except where it ties the rewards to some measure of commercial success from the patents.

HP Labs Director Lampman recently admitted that “an absence of patents would indicate you're not innovating, but having large numbers of them doesn't automatically correlate with innovation.” In any event, HP has been obtaining an increasingly large number of patents while cutting R&D spending as a percentage of sales. The decrease in the percentage of revenues spent on R&D relative to the increased patenting activity suggests the performance in the innovation area has been improving - assuming the patents aren't worthless.

HP certainly has a strong history of innovation beginning with its first product made in the famed Palo Alto garage in 1939, the 200A audio oscillator. Hundreds of thousands of HP's products have been marketed since then. These include clear winners such as HP's blockbuster inkjet printer invention in 1979 that remains an important revenue generator.

There has often been controversy around the company's innovation activities, including the inkjet itself that many thought was unwise to introduce the same time in 1984 as the competing laser printers the company was producing. HP's present inventiveness is just as controversial with its big bet having been made on being the world's largest technology supplier and dominating the IT field. There is no doubt that HP has come a long way in a relatively short time since its humble beginnings in the small garage. The HP start-up garage has recently been made a historic site. It bears a bronze plaque calling it the “Birthplace of Silicon Valley.”

HP appears to have kept its inventoritis issues in check throughout its history. The two founders never seemed to have been inflicted with serious inventoritis problems. The new management needs to be inventoritis-free to ensure HP does not lose its way moving forward.

How is Procter & Gamble Connecting and Developing?

Procter & Gamble is an old company that started selling soap and candles in 1837, and today is a global powerhouse when it comes to developing and marketing consumer brands. This huge company based in Cincinnati, Ohio, has a long history and claims to have more scientists on its payroll than Harvard, Berkeley and MIT combined[18]. Many of them work in the various large and small R&D campuses located in and around Cincinnati. People would need to move deep into the jungle to avoid coming into contact with P&G products and if they did move, they might find company scientists there studying the flora and fauna looking for a new fragrance.

The most famous products and brands are in the areas of household cleaners and personal hygiene with Charmin, Crest, Downy, Pampers and Tide being the best known from among over 300 brands. Besides cleaning and hygiene, product categories for the various brands include snack foods, beverages, pet food, drugs, cosmetics, fragrances and several others.

The R&D covers about 150 areas including materials sciences, biotechnology, nutrition, medicine (mainly veterinary) and it even gets into the areas of imaging and robotics.

P&G prides itself on being a leader in whichever areas come into clear focus. The company has the skill and might to dominate in whatever product areas it chooses to operate. Competing companies have learned to be wary of this mighty elephant as it lumbers along through the aisles of the world's consumer products retailers. P&G became a global giant by learning how to clearly identify and aggressively market products to consumer needs. The company invented the concept and practice of product management that was discussed in a previous chapter. As a result of the company losing over half its market value in the market crash of 2000, its innovation process has come under the lens.

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18. Smith, H. (2005, January). What innovation is. Computer Sciences Corporation. Retrieved April 29, 2007 from World Wide Web: http://tinyurl.com/2bdclj

A.G. Lafley took over leadership of the company in 2000 knowing the company's traditional approach to innovation was not working and that radical change was needed. It seems that P&G invented the term[19,20], "not invented here", which describes companies with inventoritis where management actively avoids or discourages supporting innovations that do not come from within. For over a century, the innovations at P&G came almost exclusively from within, as it now does for most companies.

Productivity of innovation had become flat while the exponential growth in new technologies was demanding greater innovation budgets to keep pace. Innovation costs were increasing faster than revenue growth. Lafley spearheaded a radical new open innovation model called "Connect and Develop" that now represents almost half of P&G's innovations and a large chunk of its over $70 billion revenue.

P&G spends about $2 billion per year on R&D and currently has about 7,500 researchers inside the R&D organization. The main concept thrust of the Connect & Develop program was to become able to tap into the million or more qualified researchers outside the organization and have a way to manage these additional capabilities to commercial advantage. The internal inventoritis issues had to be dealt with so the "not invented here" resistance would be replaced with enthusiasm for P&G's new "proudly found elsewhere" slogan. Lafley made the strategy clear and explicit in 2000 and set the goal at having 50% of innovation captured externally. By 2006, over 35% of new P&G products had elements that were originated externally, up from about 15% in 2000. About half the initiatives in the current product development portfolio have external elements. By becoming involved with outside innovators through various arrangements such as cross-licensing, P&G has effectively made its R&D organization 200 times larger without increasing costs.

P&G has many examples of successful innovations since the implementation of its Connect & Develop strategy. The "Swiffer Duster" is one of the best known examples. This product originated with

19. Colvin, G. (2006). Lafley and Immelt: In search of billions. Fortune Magazine 154:12-December 11, 2006.

20. Witchalls, C. (2007). Case study: Procter & Gamble. Computing - February 22, 2007. Retrieved April 29, 2007 from World Wide Web: http://tinyurl.com/2enqev

Japanese company Unicharm Corporation, one of P&G's largest competitors in Japan. Unicharm primarily makes sanitary napkins and paper diapers but sells numerous brands and products in various categories that are similar to P&G's.

It seems that a century later, P&G is the first large company to have taken and expanded on Edison's often misunderstood, ignored or forgotten practice. Edison was open to ideas coming from outside of his own operation so long as he was able to control and capitalize on these without outside innovators heading off and competing with him, much as Tesla did. P&G has started doing likewise in 2000 when Lafley took over company leadership.

There are a couple key differences. P&G has taken a very firm and public position on promoting its “proudly invented elsewhere” concept while Edison did the opposite. Edison simply went ahead and incorporated elements from outside his organization without boasting about it. Bragging about it would have undermined his carefully crafted and cultivated public image as being the inventor of whatever he was involved with. Another difference is the great extent to which P&G is establishing and operating formal processes for it whereas Edison seemed to do it on more of an ad hoc basis. This might again have much to do with the need for him to maintain his appearance as the inventor of everything he was involved with.

The similarities between the new P&G Connect & Develop strategy to Edison's a century ago suggest that Lafley and his organization have made a solid connection with Edison and are developing this approach aggressively. This consumer products giant through its CEO has created this strategy to replace its old inventoritis-riddled R&D infrastructure based on the internal 'invention model' with a more open market-led innovation system. There is a belief that Connect & Develop will replace the widespread and longstanding inventoritis model among others like P&G that are experiencing diminishing returns on their innovation activities. What is amazing is that it has taken this long for companies to start waking up to these inventoritis issues.

The Good News: R&D Spending Does Correlate with Gross Profit Margins

Although Booz Allen Hamilton researchers found no direct correlation between R&D spending and sales growth, operating profit or shareholder return, they did conclude there was a single useful correlation between R&D spending and performance that would be expected in view of Edison's pioneering work in the area.

The researchers found a strong link between R&D spending and higher gross profit margins. This was tied to other well-known research showing that much of the cost of a product is derived from the R&D based design decisions, including the extent of parts standardization, details of supplier specifications, complexity of product features and other factors affecting product costs relative to benefits. Product design improvements through both lowering costs and increasing consumer value perceptions led to higher margins.

But the study also found that these better margins did not lead to improved performance. Adding in the expenses not directly related to creating the product or service masked the gross margin benefit and killed the correlation between R&D spending and company performance. The researchers suggested that companies with higher R&D spending often have poorer strategies since they have less focus on improving their business model.

Edison had invented a successful strategy for driving down the costs of his early light bulbs to meet his market research based 40-cent target price. He applied the same type of R&D effort to that specific market-based purpose as was found to be the successful driver in the recent Booz Allen Hamilton study. Over a few years, Edison managed to drive the costs down to 22 cents while keeping his selling price at 40 cents. He was starting from $1.25 for each lamp. He did so by setting up certain kinds of machinery, changing the processes, improving work flow, and standardizing the number and type of parts while continually experimenting with different materials and suppliers. He maintained meticulous and copious records so that no useful development was lost. Some of these are among the five million pages of his papers currently preserved as part of the Edison historical record. As a

testament to the quality of his work at the time, the currently produced filament light bulbs manufactured by the billions are not much different from the ones he made 100 years ago.[21]

An example of a marketing strategy Ford has been credited with that Edison pioneered is the loss leader business model. Edison pioneered the strategy shortly after he patented the first production incandescent lamp in 1879. The lamps were costing him $1.25 each to make and he offered to manufacture them at $0.40 if the Edison Light Company would buy all their requirements from him during the life of the patent. In Edison's words, according to Henry Ford as written in Ford's 1930 book, 'Edison As I Know Him':

“The first year the lamps cost us about a dollar and ten cents each. We sold them for forty cents; but there were only about twenty or thirty thousand of them. The next year they cost us about seventy cents, and we sold them for forty. There were a good many, and we lost more money the second year than the first. The third year I succeeded in getting up machinery and in changing the processes, until it got down to so that they cost somewhere around fifty cents. I still sold them for forty cents, and lost more money that year than any other, because the sales were increasing rapidly. The fourth year I got it down to thirty-seven cents, and I made up all the money in one year that I had lost previously. I finally got it down to twenty-two cents, and sold them for forty cents; and they were made by the million. Whereupon the Wall Street people thought it was a lucrative business, so they concluded they would like to have it, and bought us out.”

Ford claims he found this principle of manufacturing he learned from Edison to be “most valuable.”

Edison was quite progressive with the management and operation of his R&D facilities. As he finished projects and tasks, he moved the Menlo Park and successor lab operations onto other work, mainly for projects he had a direct interest in but also work of other paying clients. He closed facilities when they were no longer serving his interests.

21. Ford, H. & Crowther, S. (1930). Edison as I know him. New York: Cosmopolitan Book Corporation. (pp. 50-52).

These lessons seem to have been lost in the modern interpretation of his Menlo Park operations. Given Edison's practical example, could it be that there has been a longstanding, undiagnosed inventoritis outbreak among modern lab owners and managers? Apparently yes.

From the three case studies in this chapter, it appears that 3M has done a great job in convincing itself and the world of how innovative a company it is while having much room for improvement. HP has been greatly improving the productivity of its innovation activities while maintaining enough of its inventiveness to take over the lead in its extremely fast-paced industry. And P&G has connected with Edison and is focused on developing a powerful market-led and open approach to innovation. These three companies are each world leaders in what they do and place a great deal of importance on innovation as can be seen from their huge R&D spending allocations and the extent to which they have taken strong public stands on their respective approaches to innovation.

Owners and managers of the above three corporations along with others must realize that modern day R&D processes and infrastructure waste vast amounts of money, especially when allocated to R&D spending that is completely unrelated to performance improvement - including sales growth, operating profit and shareholder return. This fundamental business error has been neglected for a very long time and stems from a gross misunderstanding of Edison and a serious misinterpretation of his Menlo Park operation which became the model for the modern industrial R&D laboratory. The only conclusion possible is that corporations suffer from collective inventoritis, much like individuals do.

From the above cases, it seems there is a growing awareness of the problem and companies are trying to do something about it. Most companies lost sight of Edison's example and have become obsessed with product research and development. They overlook the importance of having a sound marketing strategy and process while proactively ensuring their people are inventoritis-free. It's time to take off the blinders, recognize what has happened and take sensible steps towards adopting the best marketing practices while training people to overcome inventoritis.

Chapter

7 Success from Innovation: 12 Ways to Overcome Inventoritis

If you are in love with your product, then your company will fail. That's harsh. Increase the likelihood of success by not falling head over heels. Too much money allocated to innovation is being spent irrationally, as the 2005 Booz Allen Hamilton research study of the top 1,000 R&D spenders' clearly shows.

A successful innovation requires the glass to be full. A half full glass simply isn't enough. There are many things involved in bringing a product to market successfully and each one of them needs to be right, or at least close enough. The innovator, whether a corporate or a lone inventor, starts the process with a set of resources and draws upon them until the product or invention sells. This innovation process is like starting with a full glass that has holes in the bottom of it. The challenge is to find ways to plug the leaks before the glass drains completely and then make the glass overflow. Inventoritis causes people to lose sight of what is important, leading to failed product marketing initiatives.

The expression “love is blind” is a cliché but an enduring truism. Being in love with a product, idea or invention makes one unable to clearly see what needs to be dealt with and do all the

things that need to be done to complete a successful innovation. Overcoming the blinding psychological condition called inventoritis is essential to achieving commercial success in innovation. The following 12 ways to overcome inventoritis and have a successful innovation outcome are intended to help achieve this outcome. These include both organizational and individual strategies so whether one is a lone inventor, or working in or managing a company, there is something for everyone. Maintaining a balanced and reasonable perspective is central to the approach.

12 ways to overcome inventoritis and have a successful innovation outcome:

1. Assume your product or idea is terrible.
2. Know your customer, industry and business well enough to publish a book.
3. Build a solid leadership bridge between marketing, engineering and sales.
4. Make a commitment to self-improvement and be the best.
5. Be prepared to demote yourself and give up control.
6. Steal from others and let others steal from you.
7. Budget time to help others and ask for help.
8. Lead with process.
9. Create a slogan for your strategy.
10. Leverage your resources.
11. Create a powerful network of outside advisors.
12. Involve and embrace passionate customers in the product development and product marketing processes.

1. Assume Your Product or Idea is Terrible.

Assuming a product or idea is terrible can be quite liberating. This is not the same as not believing in what you are doing and it is not about being negative. On the contrary, it is about changing the frame of reference to give due consideration to the real operating conditions. Consider the advantage of having accurate maps and a compass to navigate from one place to another rather than a ball of string and a

vague idea. Having an accurate understanding of the conditions has its advantages. It prevents people and companies from squandering resources on dead ends or irrelevant excursions. Anyone moving forward who is positive, highly motivated and well equipped with accurate, relevant information and sound plans becomes virtually unstoppable. Eliminating the tendency to rely on untested assumptions can be done by simply assuming a product or idea is a terrible one and then taking steps toward making it better.

The assumption is not such a hard one to make since there is no such thing as a perfect product that will forever enrich the people behind it. The competitive free enterprise system itself, if working perfectly, mitigates the possibility. The better and more desirable the product, the more competition there is to produce and sell it. Competitors are continually struggling against each other to gain an edge.

The idea of becoming the exclusive provider of something that everyone wants or needs, that nobody except you can offer, that is technically perfect and easy to produce in unlimited quantities at low cost and that can be sold at any price you want is impossible. Getting to such a perfect product in the competitive system is like trying to achieve a perfect time in a speed race. The best that can be achieved is to perform better than the next best competitor whether one is striving for or maintaining first place or moving up a few positions from the rear. Everyone can be a winner depending on what the goals and expectations are. This is true for any competitive environment and certainly for the modern competitive market system for products and innovations.

It does not take much effort to find things that are wrong with any product. All of them are imperfect in one or more ways. Most products do not have patents and have all sorts of competitors producing and selling them. And most products somehow pollute the environment or in some other way change the world for the worse in their making, distribution, use or disposal.

The automobile is a good example. Cars are not patented. They break down, use expensive fuel, need vast tracts of land leveled and hard-surfaced to operate on, and use enormous amounts of energy and raw materials to make. They employ massive specialized infrastructure to distribute and sell. Cars also kill and injure millions of

people who use them and create huge waste management problems for the spent carcasses and the collective billions of tons of wasted gases from their tailpipes.

The beef and milk made from cows is another example. Beef and milk are also not patented except for maybe the products coming from the next generation of bioengineered cow. They too break down, unless you keep them cold or package them extremely well. They also use enormous amounts of energy and water to produce. Vast tracts of land are required for raising the cattle and growing the feed, of which only a small percentage of the input resources gets turned into beef and milk. There is a massive specialized infrastructure for making and selling these products. Several medical studies have proven that many health problems are associated with consuming excess beef and milk. The number of heart attacks and strokes attributed to excess consumption of these products is a major cause of death. Similar to cars, there are massive amounts of collective emissions, including the manure that renders many water supplies unfit for human use, plus billions of tons of gaseous emissions.

This type of fault-finding analysis can be easily applied to any product. How does it help to assume the product is a terrible one and identify its faults? It helps by forcing the consideration of strategy in a more constructive manner.

Suppose there is a patent on the product. Consider how the strategy would differ if it was the same product without a patent. Xerox went through this with the earlier photocopying technology. There was a patent and they had it but they did not get the business going until after the patent had expired and they were forced to get their act together or get knocked out of the business altogether. Xerox held on just fine and still has good market share with other major companies, mainly from Japan, including Canon, Sharp and Minolta also commanding strong positions within the photocopier market area.

Consider the idea of all strategies being out in the open for everyone to see. Would it impact the chances of success? What would need to be strengthened to come out ahead in the event the strategy was open for viewing? What is more useful or important, having a signed non-disclosure agreement with each of the internal people and suppliers or making that effort instead on improving the outward

execution? The big winners are usually the ones who execute their strategy well. There are not many front page stories about companies that became world leaders by getting everyone to keep things under wraps.

How hard is it to steal your business? If someone goes ahead and produces a knock-off of your product, would you be able to do much about it? How big a difference would it make to your business if that occurred? If you had a patent and the same thing happened, could you effectively defend it?

Most people have limited ability to defend patents. Patent actions with big outcomes for one side or the other are still so uncommon that they make the news as they occur. There are now so many knock-offs of so many products, that it no longer gets reported except in a general way. These days, like the Japanese did 20 to 40 years prior, Chinese policymakers are pretending to care about patents. Meanwhile, the myriad factories and back-shops are filling the world with knock-offs of patented drugs, media products and every type of manufactured good they make. There are few things they don't make in today's Chinese factories.

Can the order be handled? Many products are hard to make, especially if there is a sudden change in demand. For someone making something that contains an expensive ingredient, an increase in volume could cause major financial problems if the payment terms of the customer do not match those of the supplier of that expensive ingredient. What if an ingredient or component became more expensive after a big order was accepted? Consider what would happen if someone screwed up on the quality and the goods were rejected. What if a competitor comes up with a much cheaper way of immediately filling the need while in the middle of a big production run? What if all or part of the work force walks off the job for some reason? What if the production line breaks down or is in the middle of a long retooling when a big or urgent order comes along? This goes into areas like inventory management and redundant systems. Does the strategy account for it properly?

How important is proving a point versus making a profit? Is this really a business or some sort of hobby or pet project disguised as a business? Big companies often provide sanctuary for founder's pets or relics from previous projects.

Why should they care? “I have the greatest product in the world” is a useless concept if it is based on what one thinks is needed but is actually of little or no use to anyone. As mentioned earlier, Thomas Edison learned this important lesson with his first patented invention, the vote recording machine of which he never sold any. He learned from a congressional leader that the primitive manual way of tabulating votes gave minority leaders a filibustering tool as an instrument to prevent bad legislation from becoming enacted. Edison saw the truth in this and he was cured of inventing things he thought were great and confined his efforts to working on things he knew were wanted and that would have widespread application.

What is the price? This is a greatly underrated topic. Pricing is a crucial aspect of the strategy around which everything in the business turns yet tends to often be handled in an arbitrary or knee-jerk manner. No strategy would be sound without proper consideration of the pricing aspect. The typical assumption is made that the price point will be substantial and then increase with sales, after all this is a fantastic product! Marketing indicators suggest a certain entry amount, but it is often indexed to business plan low, moderate and ideal scenarios. But the knee-jerk entry is often too optimistic, with disappointment in the months that follow as the venture becomes another statistic of failure. To combat this by assuming the product is terrible, realism wakes up the inventor/seller. Then products get priced more realistically with a more sensible pricing strategy to optimize success.

Does the environment matter? Until recently, environmental aspects have been neglected and typically they still are. The costs of hauling solid wastes from the manufacturing site to a local landfill have been about all that needed to be considered for most manufacturers. Since the dawn of the industrial age, if one can get wastes into a liquid or gaseous form, there is no cost attached to it once it exits drain pipes or smoke stacks. That is only now changing for the vast majority of the world's manufacturers. The impacts on strategy will become more substantial as the world reconsiders the longstanding concept that the ultimate solution to pollution is dilution.

Assuming the product is terrible releases innovators from their biases and establishes a better vantage point from which they can constructively consider strategy. Making this assumption can be quite liberating and this simple act alone can make a significant difference in improving the odds of having a successful innovation resulting in a positive financial experience while overcoming inventoritis.

2. Know Your Customer, Industry and Business Well Enough to Publish a Book.

Writing is a process that distills thought. Corporate innovators are often asked to prepare detailed plans. Companies employ a variety of planning tools and they can be tremendous aids in working through the necessary thought processes. Every lone inventor seeking funding who has approached professional finance people to get a project financed is aware that he or she is expected to come with a written business plan. The thought process that goes into the writing is more important than the document itself. The fancy business plan with all its detailed financial projections becomes useless about five minutes after the business gets going, assuming it was any good to begin with. Things change and, unless the plan is regularly rewritten or revised, it is very unlikely to match reality for long. It would be like having a football coach writing a detailed set of projections for an upcoming game then expecting the game to match the projections. It won't happen but it can be quite beneficial to engage the thought processes.

This can be taken further by writing a book with a view toward possibly publishing it. The best way to learn about something is to be in a position to teach it well. Thinking about what would need to be written to communicate to an audience larger than that for a business plan takes the process to a higher level. Writing the business plan and also writing the book on the customer, the industry and the business requires a thorough understanding and generates additional material that can be reviewed and evaluated.

Everyone has heard or read enough about the importance and need to listen to and understand customers. People tend to do a fairly good job of this aspect of knowing the business. There is much more to knowing one's business than listening well to customers, but that is a great place to start.

Listening to and understanding customers directly is usually although not always better than relying on secondhand data in knowing one's customer and industry. There are some areas where substantial business can be done without direct knowledge of the customer but that is not the norm. With few exceptions, listening to the customer is extremely useful and important. The last section of this discussion (#12 below) takes this idea of listening to the customer further.

Listening to and understanding a competitor is also important. A goal of listening is to gather enough market intelligence to develop an accurate picture of the market, competitive landscape and one's place in it.

But don't just listen. Analyze the data and think it through. Learn 100 new things about the customer or prospective customer. Call it the Strategic 100. Do likewise for each of the competitors. If that wasn't so hard, then rank and take the top 10 items from each list, and do a second round to obtain the original list and another 100 item list focused around the top 10 items. Call it the Focus 10/100.

Those who enjoy performing this type of analysis can do it again and, as long as they don't end up with analysis paralysis, will have a very good idea of where the customers are and what is the true competitive landscape. Although this is hard work, at the end of it, one will be able to answer the following questions and many others. “Could you tell me a hundred ways to identify your target market?” “What do customers love about your product?” “What do they love about the competitor's product?” “What do they hate about yours?” “Theirs?” “What 10 things from each of your main competitors are you going to steal or copy?” This can be taken as far as is practical. Whether thinking in terms of copying best practices or stealing key employees and customers, there is a range of options. A market player can rest assured the best from among their competitors are doing similar things.

Written analysis is quite useful but can also be highly time consuming. It is important to be careful to not get caught in the analysis paralysis trap. This is where one becomes so busy going around asking questions, learning stuff and writing that the actual business does not get done. Beginners often experience this. An effective way to go about it is to develop good intelligence gathering habits and systems as part of the marketing and sales process: Learning by doing, learning while

doing and doing while learning. Efficiently rendering the intelligence into well organized and well written content can be hard work but the process should prove to be worthwhile and rewarding.

Not all people write equally well, and while rendering intelligence into a useful document may be an easy task for one person; it could be daunting for someone else. Fortunately, there is nothing wrong with getting help. Most inventors, whether corporate or individual, do not write their own patent specifications and claims, leaving it to patent agents who are skilled in this type of specialized technical writing. Likewise, help can be brought in to prepare business plans, whitepapers, speeches, articles, books, etc. For many lone inventors, the costs of hiring outside help becomes a barrier, so by the time the patent writing has been paid for, there isn't enough money to hire anyone to help write business plans and the myriad other written materials that are required in the process of bringing an invention to market. Learning how to write well enough to get the job done should become a priority for those who cannot recruit or hire others to do it.

Substantial market strategy and market research work should be done before any money is spent on technical development. The further along the technical processes, the harder and more costly it becomes to change course. Doing a solid and thorough job of the customer, industry and market strategy and research work up front makes it easier to direct the technical development in the optimum direction. Fewer course corrections can result in substantial performance improvement of the technical effort.

Knowing the business well enough to be able to write a book about it and then actually writing the book is a good way to overcome inventoritis. This should be done before any technical work is started. Well managed companies have processes for doing this while engineering-driven companies often do not and create products for which there is no customer and no sales. Applying substantial resources up front toward knowing the customer, industry and business well enough to publish a book on it is an excellent way to overcome inventoritis and navigate toward a successful innovation.

3. Build a Solid Leadership Bridge Between Marketing, Engineering and Sales.

Most engineers hate sales and most sales people hate engineering. Neither seems overly interested in the marketing people who are often regarded as little more than functionaries or bit players performing in supporting roles. This is not a great starting point for those wanting to create a successful innovation.

A great team effort is what is needed, rather than engineering and sales groups working in relative isolation and there being no clear leadership coming from the center for marketing strategy. In big companies with R&D centers, the problem is even worse because the R&D people including scientists and engineers are tucked away in their silos, the engineers that make the products are in the engineering centers and factories and the sales people tend to stay away from these places. When they are not out on the road calling on customers, the sales people might occasionally visit the various factories and silos, with or without a tour group in tow, but they usually don't hang around or keep offices there.

The marketing people are mainly sales support staff, product managers and product marketing managers. They have plenty of responsibilities but little authority. They do not clearly lead the marketing or innovation strategies. That is often left to the CEO who has plenty to do already, is not an expert product marketer and often does not have the requisite skills or much interest in defining the marketing strategy. Sometimes the chairman ends up doing it. Great teams with great leadership are required for great innovation success and that simply hasn't been happening in innovation to nearly the extent it should. There are exceptions including famous automobile industry leader Lee Iacocca, the controversial Apple co-founder and current CEO Steve Jobs and Bill Gates with his Microsoft team.

Iacocca started out as an engineer at Ford, later switched over to sales, and then quickly rose through the ranks, moving into product development. He was involved with the design of several successful Ford products. This includes the Ford Mustang launched in the mid 1960s that sold over a million units within the first 18 months and remains one of Ford's most popular products. He eventually became president, and then left Ford in 1978, a year in which Ford posted a $2

billion profit. He then took over as chairman of the ailing Chrysler Corporation. He was quick to cut production of several large models and launch various sub compact models that were instant hits. Several small models followed that also sold well. He then launched the first minivan which was a smashing success. The minivan and its SUV progeny remain among the world's best selling vehicles.

Engineers who move into sales are scarce but those who make the move often do well. Iacocca's example is an excellent one because it shows how someone who has a good grounding in both engineering and sales with control of the marketing strategy can produce excellent results through successful innovations. The reverse scenario, where someone moves from sales over to engineering and then into a position of controlling the market strategy highly effectively, seems less common. This might be due to the advantages of formal engineering education and training that stresses mathematical skills, disciplined thinking and a certain degree of steadiness and consistency in work practices.

Sales people often end up running marketing strategies and companies but usually without the excursion into engineering or through the product development area. They often get little respect from the technical people. Among the examples of people going from sales over to the product development side and then into a position leading marketing strategy is Apple Computer's mercurial co-founder Steve Jobs.

Jobs attended various after-school lectures at Hewlett-Packard in Palo Alto, California, during his high school years and took a summer job at HP. He only attended one semester at a liberal arts college. After dropping out, he still attended classes, including one on calligraphy that influenced the development of typefaces and proportionally spaced fonts in Apple products. Jobs co-founded Apple in 1976 with computer engineer Steve Wozniak and others. He started selling and marketing products, beginning with a computer Wozniak designed for his own use.

Jobs, a controversial leader and manager with some serious issues, was forced out of Apple in 1985. He then bought Lucasfilm's graphics division, later renamed Pixar, for $5 million plus another $5 million in

financing. Disney acquired Pixar 10 years later for $7.4 billion in Disney stock, worth about a thousand times the original amount Jobs paid for it, making him Disney's largest shareholder.

Also in 1985, Jobs founded NeXT Computer, which he ran with a very close eye on the technical developments, especially the aesthetic qualities of the products. He had some inventoritis issues and NeXT computer hardware sold poorly with only 50,000 units sold in 1993. The units were too costly, due mainly to Jobs' obsession with design perfection. The hardware division was shut down and the company focused on its NeXTSTEP software offerings that were sold for use on Intel processor equipped machines.

Apple bought NeXT in 1996 for $400 million and a year later Jobs became CEO of Apple, initially on an interim basis. Jobs had overcome his inventoritis issues and scrapped numerous failing Apple products. He also pulled technology from NeXT into Apple, moved into new business areas with the iPod and iTunes music products and built Apple into a very different and interesting company. His product marketing strategy also included reaching into the wireless telephone business with the iPhone introduction. Jobs remains controversial but his ability to successfully commercialize innovations is beyond reproach.

The common theme in these examples is that someone with a good grounding in both the engineering and sales areas, regardless of where he or she starts, who has great marketing savvy and somehow ends up leading the product marketing (including having control of the engineering and sales areas) can do amazing things for a company. Formal college training is not a requirement as the Jobs example suggests although, as in the case of Iacocca, the rigorous formal training seems to help.

A greater fusion of engineering and marketing leadership should benefit companies where innovation and products are an important part of the business. It seems the normal or traditional practice is to isolate sales from engineering and not have them meet until at the very top. The CEO by default ends up having to lead the marketing strategy although that individual might not have sufficient grounding in each of

these two areas to do so effectively. This does not need to be the case and Microsoft has established solid leadership of the marketing strategy without having leadership default to the CEO.

Microsoft was the world's top R&D spender in 2004. In 2006, the company spent $6.6 billion on R&D, about 17% of its $44 billion revenue. From a 2005 Booz Allen report on the top 1000 global R&D spenders, the 2004 rate for the global top 20 R&D spenders combined was 7% and for the next 980 was under 4% so it is evident that Microsoft places tremendous importance on its R&D activities and that these form an important part of its marketing strategy.

In January 2000, Microsoft Chairman and CEO Bill Gates stepped down as CEO and took on a new role for himself as 'Chief Software Architect,' a role he has remained in until June 2006. Microsoft has two other uniquely defined roles, that of 'Chief Technical Officer' (CTO) and the other being 'Chief Research and Strategy Officer.' No other company has this arrangement of officers, although the CTO role has become more common in recent years among companies working in high-tech fields.

In a June 15, 2006 announcement[22] made by Microsoft, the new arrangement was described as follows:

> The company announced that Chief Technical Officer Ray Ozzie will immediately assume the title of chief software architect and begin working side by side with Gates on all technical architecture and product oversight responsibilities, to ensure a smooth transition. Similarly, Chief Technical Officer Craig Mundie will immediately take the new title of chief research and strategy officer and will work closely with Gates to assume his responsibility for the company's research and incubation efforts; Mundie also will partner with general counsel Brad Smith to guide Microsoft's intellectual property and technology policy efforts.

22. Microsoft Corporation (2006, June 15). Microsoft announces plans for July 2008 transition for Bill Gates. Microsoft PressPass - Information for Journalists. Retrieved April 29, 2007 from World Wide Web: http://tinyurl.com/kl6yh

Figure 2: (L-R) Microsoft Chairman Bill Gates, Chief Research and Strategy Officer Craig Mundie, Chief Software Architect Ray Ozzie and CEO Steve Ballmer. Courtesy Microsoft Corporation.

The above group photo (that also includes CEO Steve Ballmer) clearly represents Microsoft's core marketing strategy team. These are all top level leaders within the industry. There could not be a clearer indication of the importance placed by Microsoft on having great leadership and solid bridging between strategy, research activities and the development of its product offerings.

According to Gates, Microsoft's R&D spending is split roughly 75% in the development area and 25% on pure research and incubation activities. Customers are involved in seeing the work done in the prototype and incubation processes. Microsoft is operating in challenging business areas where potential disruptions occur quickly and frequently. The company has done an excellent job determining the actual and anticipated market needs and its business was never disrupted. Threats to its business model such as the competing 'free' LINUX operating system were properly addressed and did not materially impact Microsoft.

Microsoft has done an outstanding job handling potentially disruptive changes and does not appear to have a habit of supporting R&D activities on anything other than a well managed, market strategy led basis. It has more than doubled its annual R&D spending since Gates took the Chief Software Architect role in 2000 to US$6.6 billion in 2006, and it is expected to be increased again to $7.5 billion in 2007. Microsoft offers a shining example of a company with few if any inventoritis issues that got the innovation leadership approach right. It had to innovate in creating new job titles and an arrangement of officers unfamiliar in industry in order to make it work.

The reasons behind why sales people and engineers do not get along as well as they should are not well understood. In practice it seems that engineers don't like it when sales people come along wanting all sorts of changes made to the products, creating myriad engineering headaches. Conversely, sales people get frustrated with the amount of time it takes to get stuff done through engineering and don't understand why they can't get whatever they ask for in response to customer requests. It seems that while engineers are bound by the laws of physics and chemistry, sales people are similarly limited in what they can do based on what customers are willing to buy. The traditional approach of keeping these groups in isolation, allowing each group to concentrate and focus on its respective interests, does little to facilitate constructive relationship building between these equally essential groups.

Some practical suggestions to help build stronger bridges between engineering and sales would be for engineers to go along on some sales calls and interact with customers and others in the market. Likewise, sales people should shadow an engineer for a while. The process is about getting to know, understand, appreciate and respect each other's specialties and interests. Whether this can be done by sitting in on each other's meetings, events and conference calls or taking courses - it needs to get done. The goal is to create an open environment where they can learn from each other and celebrate each other's successes. Engineers and sales people alike can benefit tremendously by getting serious about understanding and supporting sound marketing processes and each other's roles.

Currently, few companies have solid leadership bridges between marketing, engineering and sales. This needs to improve if R&D spending is expected to be applied more rationally, resulting in more predictable outcomes and improved returns on innovation dollars. Engineers and sales people ought to learn more about each other's areas so there are fewer conflicts. The person who makes the key decisions on innovation must be someone free of inventoritis, an expert marketer well grounded in both engineering and sales, for this to work optimally. The best way to overcome corporate inventoritis is to have innovation activities led by someone who does not have inventoritis. The leaders who tend to do well in this regard have a firm grounding in both the engineering and sales areas and have become marketing experts. It should not default to the CEO or chairman unless that person is interested and fits the bill.

4. Make a Commitment to Self-Improvement and Be the Best.

Thomas Edison took the idea of self improvement to an extreme. At an early age, he read almost every book in the Detroit Public Library. He continued this practice of reading vast amounts of materials throughout his long and productive life. He always tried to surround himself with people he could learn from. Mistakes and failures were considered progress towards right answers, which included the elimination of things that didn't work. Hard work and hard thought were hallmarks of the Edison method. He wrote out his goals and maintained an extensive written record of everything he believed was worth writing about, with an amazing five million pages of his papers having been preserved as part of the Edison historical record.

Just as Edison did, golfer extraordinaire Tiger Woods has made a serious commitment to self-improvement. Woods also has prioritized practice and hard work as central to his successes in golf. There has been a debate going back centuries as to whether success is derived from innate natural talent or if practice and hard work are key. The question is not settled but more and more research shows that great success is not based primarily on natural talent. Painful and demanding practice and hard work seem to be the more important drivers of success.

A famous example of this success model of innate, natural talent with hard work is the world-renowned Japanese violinist and teacher Shinichi Suzuki. The principles and philosophy of his teaching methods for developing the natural abilities of every child are legendary. Living to be 99 years old, Dr. Suzuki always seemed young. He was full of energy and was cheerful and loving to everyone he met. He wrote in 'Nurtured By Love' in 1969, “If Einstein, Goethe and Beethoven had been born during the Stone Age, wouldn't they likewise have had only the cultural ability and education of men of the Stone Age? The converse is also true: if I were to receive a suckling babe of the Stone Age and educate him, before long he would be able to play a violin sonata by Beethoven as well as any young person of today.”

There are many books, courses and programs on the subject of personal development, the modern equivalent of Edison's self-improvement philosophy. A person who is committed to self-improvement will eventually overcome any inventoritis as a result of their personal growth. They'll simply outgrow it by continuing to learn, not becoming stagnant or falling behind the times. The act of continuing to learn itself implies you are aware you don't know everything and are always open to change and improvement.

Edison, Woods and Suzuki had something else in common. Each became the absolute best in the world at what he chose to focus his main efforts on. Edison's record as an inventor, innovator and product marketer remains untouched a century later. Students of the Suzuki method are recognized as part of a worldwide movement in music education that features pure excellence among child musicians in violin, piano and other classic instruments. Woods' golf record is similarly singular and he is the best in the game, continually adding to his accomplishments.

Not everyone can be the best in the world at something unless there are several billion things at which to be the best. However, everyone can strive to be the best and, given how each individual is unique, everyone can become the master of his or her unique area of contribution. These innovators offer tremendous examples, from very different fields, in very different times, of people who come into this world much like everybody else, unlock their potential and through dedicated practice and unrelenting hard work become the best in the world.

Self-improvement should not be limited to individuals. Companies and organizations should always be applying similar processes to ensure they become better. One of the most important aspects of the competitive free-enterprise system is that excellence is rewarded whereas sloth and poor performance is penalized by natural operation of the market system.

There is something amazing that happens in the competitive world we live in today. As people become better at what they do and start becoming recognized for it, good things often start happening that in turn help them to further improve. It is a non-linear effect and there are tremendous advantages to those who understand and accept this effect and are able to embrace it. Edison and Woods both extensively researched and learned to manage the process of winning and becoming more successful to their respective advantages. Wealth and power accrue to the account of those who understand and manage this process well. Edison and Woods both benefited in this regard.

It is important to remember that whether we like it or not, the world is competitive and winners earn a disproportionate part of the rewards. First place has a much bigger prize attached to it than 2nd, 3rd, 4th, or 5th place typically do. This is generally true whether there are 100 or 100,000 competitors. What is equally true is that the game and its rules can be defined or redefined to whatever extent people are willing to subscribe to them.

Many businesses operate with an understanding and appreciation of this idea. This can be applied so that individuals and companies can take 1st place in a game of their choosing. Edison was able to define his own game because American industry was still in its infancy, whereas Woods could not since the rules for golf are well established. However, Woods was able to define and invent effective strategies for how he approached and played the game. Companies often go through great lengths to become perceived as the #1 in their industry or category. By doing so, they usually receive a larger share of the rewards. Larger is to be expected; it's the disproportionately larger that is of interest here.

An excellent way for corporate and individual innovators to overcome inventoritis is to make a commitment to self improvement while striving to be or become the best. The benefits accrue non-linearly while inventoritis simply can be outgrown.

5. Be Prepared to Demote Yourself and Give Up Control.

One of the thorniest issues arising in relation to inventoritis is the one of power and control. People with inventoritis often don't know when to hang on and when to let go of control. They tend to be poor negotiators, much more litigious than normal, unbalanced when it comes to dealing with transitioning power and control and generally very difficult to deal with constructively in these areas. This is most evident in the case of lone inventors but also appears quite often with corporate innovators.

Most inventors possess remarkably little ability to rationally determine the value of their works. Gross exaggerations of the values of their ideas, invention and their inputs into the process are the norm. Being in love with their product or idea further compounds the problem by making everything too personal. Any questioning of their value is taken personally and often perceived as an attack. This inventoritis causes these people to become extremely possessive in most cases. Their self esteem is also partially attached to the value of the invention. Innovators with inventoritis are not reasonable people when it comes to negotiating value and transfer of control of their inventions, products or businesses.

The rivalry between Bill Gates and Steve Jobs that came to a head in 1984 involved serious inventoritis issues. Unlike Jobs, Gates did not have inventoritis to any observable degree. Jobs had a large loyal group of followers who were in love with Apple's products. When Microsoft developed its Windows 1.0 product in 1984, Jobs and his supporters went ballistic, accusing Gates of “stealing from us.” Gates and Microsoft didn't really seem to care since they were focused on effectively marketing products to a wide customer base. The next section suggests the merits of stealing in relation to overcoming inventoritis.

Microsoft traditionally has produced products widely perceived to be second rate but in huge volumes, much like the Japanese companies of the day were doing with manufactured goods. Margin-enhancing

quality improvements were to follow later, once the market and a firm position in it were established. The Microsoft strategy worked brilliantly and Gates is currently the richest man in the world. Jobs got thrown out of Apple the following year, in 1985.

Fortunately Jobs was teachable enough that he was able to overcome his inventoritis and recover over the next 10 years. He learned a great deal in the process of founding and trying to build NeXT into a major computer manufacturer during the years from 1986 to 1994. This attempt to mass market his vision of a great personal computer failed miserably with only 50,000 units sold in 1993. Jobs ended up turning NeXT into a software-only company over the next two years and then went back to Apple in 1996 when Apple bought NeXT. He became the interim CEO of Apple, later made permanent, and by this time had learned enough to be able to rationalize the company and move it forward constructively.

During the 1997 Macworld event, Jobs announced “The era of competition between Apple and Microsoft is over.” He announced that Microsoft had bought $150 million worth of Apple stock. Gates appeared on a big projection screen to announce a version of Microsoft Office for Mac users. This was a shock to the Apple crowd who always considered Gates the enemy and somehow evil. Apple and Jobs have been doing great things since then.

Unlike Nikola Tesla who never overcame his inventoritis, Jobs learned when to hold and when to fold. Tesla never made peace with Edison and died broke and miserable albeit in full control of his non-existent business. Jobs knew enough to make peace with Gates after losing the personal computer war. They then worked together toward mutual success. Apple and Jobs have since been able to focus on their core strengths, innovating and commercializing fabulous products that people love to use.

Most inventors are loath to give up control. They also have a difficult time recruiting experts. On the other hand, some inventors give up control too quickly or easily and this is not such a good thing either. They will basically hand off their invention, almost like leaving a baby on a doorstep.

For inventions, a common outcome is that the people or companies that take over the invention often fail to pay royalties once they get deep into the process of further developing or commercializing the invention. They figure they are putting too much effort into getting the job done and somehow don't feel like sending money to a non-productive inventor who just sits around waiting for money to come in the mail. These inventors who leave too soon are also often litigious and get into problems when they feel the need to start suing people or companies they once sold out to.

There is a balance that needs to be maintained for optimum results. This is almost impossible to achieve when one or more of the parties has unresolved inventoritis issues. In order to maintain balance, parties need to be able to see eye to eye on value and be able to negotiate reasonably. This seems simple enough yet can be very difficult in practice.

The way to overcome inventoritis that relates to managing power and control issues is one of the most difficult areas to address. There is no easy answer. Parties who are aware of their own strengths and weaknesses have an advantage. People who are willing to recruit or hire experts tend to have fewer issues with power and control. Those who know themselves well and are teachable and comfortable in their abilities seem to have fewer power and control issues than those who are insecure or uncertain of their position. Those who are insecure should work out their issues before they come to the table

6. Steal From Others and Let Others Steal From You.

Copy, copy, copy. Engineers are taught in engineering school programs that good engineering typically comprises 45% duplication, 45% slight modification and 10% original work. This includes the qualification that if the ratio cannot be maintained, the increases should be in the former and not the latter areas wherever possible. There are good reasons for this and it also has application to areas outside of engineering.

Originality is overrated. The advantages of duplication over originality are numerous. Something that has already become tried and true is just that: tried and true. That decreases the risk and uncertainty considerably. Duplicating something is less costly than producing an

original. Something that has been in use has likely had a lot of the bugs knocked out of it and has already become perceived as useful and acceptable. For manufactured products, it is almost always less risky, faster, cheaper and easier to incorporate an existing part already in production than to design and make an original.

There is no shortage of examples of stealing. The discussion in the previous section of Microsoft cloning much of Apple's user interface is as good an example as any. Edison stole the light bulb invention from Joseph Swan and others. In fact, the practice of stealing has been formalized in industry with terms including “benchmarking” and learning, copying, duplicating or applying “best practices” having become nice corporate euphemisms for it.

The reverse of stealing is also interesting. Innovators should beware of situations where no one is stealing from them. That would suggest the idea, product or invention is not worth stealing - a terrible thing from a marketing perspective. Many successful innovators encourage others to steal from them. It creates interest in their products and some of these thieves can later be converted to customers. Xerox is in the habit of leaving its PARC doors open to thieves.

The 1980s battle of Steve Jobs and his Apple Macintosh graphical user interface versus Bill Gates and his Microsoft Windows has been widely publicized and there was even a movie (or two) that came out over it. Jobs' claim that Microsoft was stealing the Mac interface and turning it into Windows was interesting because he was himself boasting about having stolen the graphical interface from Xerox PARC.

In 1980, Gates hired Charles Simonyi, a programmer who worked at PARC in the 1970s and developed the first WYSIWYG (what you see is what you get) display as a word processor called Bravo for the Alto workstation. Apple was likewise getting technology through people it was stealing from Xerox. Both Jobs and Gates were busy stripping all sorts of people and technologies out from Xerox while calling each other names. Whether or not the Xerox shareholders got much value out of this through eventual sales profits or licensing fees is a good question. In any event, the graphical user interface had its origins there, although its eventual commercialization was over at Apple and Microsoft.

If the Xerox management had intended to pave the way for the development of personal computing as part of its marketing strategy, that aim was well achieved. It appears the Xerox strategy might have been missing a couple elements such as where its profits were going to come from in supporting this.

A business is probably not the best place one can go to fully express one's creativity and ability to conceive original ideas. Original ideas are costly to develop, with great uncertainties in outcomes. The constraints imposed by the competitive profit-maximizing impetus make it much better to adapt existing solutions with minimum expensive original efforts wherever possible to market-based needs. Innovators need to learn to deal with the fact that originality is overrated. Effectively using the strategy of stealing from others and letting others steal from them is a constructive way to approach marketing while overcoming inventoritis.

7. Budget Time to Help Others and Ask For Help.

Inventoritis can be overcome by becoming involved with helping others, especially those who do not have the condition themselves. There are benefits to associating in groups of like-minded individuals such as those who get together and form inventors groups for inventors to work on ways to exploit their inventions. The benefits are much greater in associating with and helping others who are powerful obtain what they need or want, then asking for return favors.

Everyone needs help and should be willing to give and to receive it. This is part of what it means to be human and a member of society. It should be a natural part of what we all do. This can be done in an ad hoc way and it can also be done in an organized systematic way as done by most charitable organizations. Everyone should be free and able to pick and choose who they associate with. There is a great deal of material about developing and maintaining healthy and productive relationships that does not need to be repeated here. How this relates to overcoming inventoritis is the focus of this discussion.

One suggestion is that inventors should feel free to join an inventors club, seek out fellow inventors and work on helping each other to market their inventions. A better one would be to associate with people who are already good at something that is relevant to the process and

become involved while learning new things. For example, most technical people don't spend much time hanging out with sales people. Rather than hanging out with peers, why not go out and get involved with a sales organization? There is no better way to learn about sales than to go out and sell stuff door to door for a while, join a multi-level marketing organization or do something similar. Likewise, sales people might have fun showing up where technical people hang out, such as at computer user group meetings or specialized sporting events.

There are also nonprofit organizations specifically established to help people develop useful skills. An excellent example is Toastmasters, with clubs located in most communities and large companies to help people develop their communication and leadership skills. Toastmasters International is the world's largest organization dedicated to this and the costs are modest, typically around a couple hundred dollars per year including meeting fees and educational materials. The clubs are of either the open or closed type and easy to join by simply dropping in on one of the open club meetings for free as a guest and later joining if it seems appropriate. Open clubs welcome people from the community while closed clubs are sponsored by companies to serve their staff.

For corporate innovators, it is usually not a bad thing to support a customer's charity or event. This can be done in many ways including recruiting volunteers to get involved with volunteers from the customer organization at an event.

For individuals or organizations, getting involved in giving seminars to school or community groups can be helpful. Writing a blog or free articles for nonprofit organizations is a way to help them while developing some name recognition.

There is however, a very practical way to move forward in business that is not based on altruism and that should always be considered. Help people who have what they want to get more of what they want, especially if they have something desirable. To get rich, one excellent way is to help someone who is already rich become richer. Chances are that if someone is highly successful, he or she will not have inventoritis and may be a great role model or mentor for a person or organization trying to overcome it. Steve Jobs appears to be taking this approach in recent years since making his peace with Bill Gates. For

innovators like Jobs working in fast moving industries, turning a powerful enemy into a powerful ally can make a world of difference. Nikola Tesla did not make amends with Thomas Edison and ended up paying a high price.

Innovators interested in overcoming inventoritis should help others and ask for help when they need it.

8. Lead With Process.

Thomas Edison was a master of process. It was central to everything he did. He is the godfather of General Electric, currently the world's 12th largest company. His famed Menlo Park laboratory became known as the world's first invention factory. Edison converted traditional research methods into an industrial process. Henry Ford learned from Edison and applied similar methods to convert the craft of automobile making into an industrial process. He quickly built the Ford enterprise into a global scale company by pioneering the moving automobile assembly line. Ford is currently the world's 11th largest company, falling from 9th place in 2005.

Revenue Rank 2005	Company Name	Revenue US $millions	Profits US$ millions
1	Exxon Mobil	339,938.0	36,130.0
2	Wal-Mart Stores	315,654.0	11,231.0
3	Royal Dutch Shell	306,731.0	25,311.0
4	BP	267,600.0	22,341.0
5	General Motors	192,604.0	-10,567.0
6	Chevron	189,481.0	14,099.0
7	DaimlerChrysler	186,106.3	3,536.3
8	Toyota Motor	185,805.0	12,119.6
9	Ford Motor	177,210.0	2,024.0
10	ConocoPhillips	166,683.0	13,529.0

2005 was the year that long-dominant American automakers were displaced from prominence by Japanese producers, while also being a great year for oil companies since the American invasion of Iraq.

Alfred Sloan was at General Motors in competition with Ford. Sloan took the process concepts of Edison and Ford and extended the idea to the corporation itself, thereby inventing the modern corporation. To everyone's amazement, he beat Ford while taking General Motors from a 12% automobile market share in 1920 to 52% by the time he retired as chairman in 1956. General Motors had become the largest and most profitable corporation in the world. General Motors is now the 5th largest company in the world while being the largest automobile manufacturer. One of Sloan's most famous quotes is “The business of business is business.”

Sloan earned an electrical engineering degree at the early age of 20 and got his start in business running a ball bearing factory his father had purchased. Ford was its biggest customer and Olds Motor its

oldest. Sloan convinced General Motors to buy the bearing company for $13.5 million rather than build its own. He became a vice president of General Motors in 1918, president in 1923 and chairman in 1937.

General Motors had its share of technical innovations including the development of the four wheel drive vehicle. However, the greatest innovations were in non-technical areas. Sloan created and deployed the staff principle of management. He determined how to break the company down into smaller divisions with each product in its own division. He centralized administration and decentralized production. Executive decision-making was structured such that senior executives would have some central control without interfering too much with the decision-making in each division. Decision-making based on key financial data was made a very important process within General Motors during his tenure.

The Alfred P. Sloan School of Management was set up at the Massachusetts Institute of Technology as a graduate program in management oriented toward preparing technically-trained people for running corporations. Sloan spent several million dollars funding this school as part of the process of creating leadership for American corporations. He wanted people to be great with the numbers and masters of the marketing process. The school seems to have done better with the former of these two areas.

Sloan made impressive marketing process innovations. He eliminated internal brand competition by establishing a pricing structure to cover the whole market from lowest to highest priced units with Chevrolet and Pontiac at the bottom, Oldsmobile in the middle and Buick and Cadillac at the top. Buyers could purchase any model from basic to luxury according to their means while not having to leave General Motors, even as they replaced their cars from time to time. Sloan introduced annual styling changes and the planned obsolescence strategy while Ford remained focused on producing the single car that would work for everyone. Sloan began marketing cars with the view that there would be two or more in each household.

Other marketing innovations include having pioneered market research, public relations and innovations in advertising. Sloan was a very aggressive advertiser, pushing cars with the slogan “a car for every purse and purpose.”

Sloan out-marketed Ford in many ways, permanently knocking Ford from its once dominant market share position of over 50%. It took him 30 years to do it but Sloan's process innovations in the transformation of the corporation to a giant, rational, decision-making, profit-making machine, plus his marketing and technical innovations, ruled the business world for over half a century - until the Japanese industrialists came to power in the 1980s. Japanese automobile manufacturers including Toyota are very much process-oriented.

Those innovators who lead with process cannot easily succumb to inventoritis simply because a process orientation does not allow much room for it. Innovators who think in terms of establishing processes for commercializing, enjoy the process of marketing their inventions or products more if they think in terms of doing it repeatedly - especially when they are proactive like this with their first projects. This is what Edison did.

9. Create a Slogan For Your Strategy.

Creating a slogan for a strategy is not the same thing as creating an advertising slogan for a product or service. There is so much information floating around with the Internet and all the various media types that it is becoming more difficult than ever to keep track of who is doing what in the world. Creating a simple slogan, preferably of five words or less, for the marketing strategy can help keep everyone inside the organization plus all those outsiders who are interested, engaged and involved.

Not enough companies come up with slogans to describe their marketing strategies. It seems hard enough to come up with advertising slogans. Having to come up with ones for the marketing strategy becomes an additional chore. The benefits can be tremendous in communicating the strategy. A word of caution: slogans need to be considered carefully and should not be used as a management tool for beating up employees as has often been the case. The goal is to communicate the marketing strategy in a clear and concise way that everyone can understand, appreciate and buy into.

A highly successful North American trash removal service started in Vancouver, Canada called "1-800-GOT-JUNK?“, cleverly named the same as their telephone number, has a great marketing slogan. This

company founded by Brian Scudamore in 1989 is known as “the FedEx of junk removal.” Scudamore's five word slogan communicates the marketing strategy quite clearly. Nothing more needs to be said to explain it. The media picks up on it readily so Scudamore is able to garner much free publicity in lieu of otherwise expensive advertising. In the previous section, Alfred Sloan made General Motors' slogan “a car for every purse and purpose.” It was effective in ad campaigns while also communicating part of its marketing strategy both internally and to consumers.

A more complex example is in the case of Swedish low cost home products retailer IKEA that was founded in 1943 by Ingvar Kamprad at age 17. The company motto is “Affordable Solutions for Better Living” and its vision is “To create a better everyday life for the many people.” These are interesting enough from an advertising viewpoint but IKEA's marketing slogan “We do our part” is genius. It is in the center of their marketing positioning statement that in its entirety reads “Your partner in better living. We do our part, you do yours. Together we save money.”

IKEA's business model in regards to its furniture business is what made the company a huge success with 250 warehouse-sized stores in 34 countries in 2005, with 20 having opened that year. The furniture is designed to be assembled by the consumer and is displayed but not sold in an assembled form. The furniture is manufactured and sold flat-packed rather than assembled, to greatly reduce shipping costs and shipping volume. Many of IKEA's customers, especially those in Europe, normally use public transportation. The flat-packed products allow for transport via public transportation from the store to the consumer's home where it is then assembled.

The marketing strategy slogan “We do our part” encapsulates the essential aspect of the strategy and focuses on IKEA's part which is their “commitment to product design, consumer value and clever solutions. By using inexpensive materials in a novel way and minimizing production, distribution and retail costs, our customers benefit from low prices.”

Innovators developing a slogan for their marketing strategies should think in terms of answering the following questions:

- Can you describe your marketing strategy in five words or less?
- Can you describe your product in five words or less?
- Do you have a cost effective way to demonstrate or communicate the value of the product?

The thought processes involved in determining a slogan for a marketing strategy helps to overcome inventoritis by forcing a thorough consideration of how to concisely communicate what the value proposition is and how it will be delivered. Advertising slogans, company mottos, mission and vision statements can be developed at the same time but, contrary to current popular opinion, the more important of these is the marketing statement. It gets into the heart of the business. Make it unique, although it may be hard homework.

10. Leverage Your Resources.

Famous Greek mathematician and engineer Archimedes around the year 250 BC, stated “Give me a place to stand and with a lever I will move the whole world.” As it turns out this was not a practical engineering idea but nevertheless a very useful one if properly applied in the marketing field.

Marketers are traditionally in the business of positioning product and service offerings in such a way as to make them attractive to buyers since their job is to anticipate, identify and satisfy customer requirements profitably. This seems to be a somewhat passive approach with customers being in control as marketers seek ways to make offerings attractive to buyers. Marketers can achieve much greater results if they can find a suitable leverage point, put in a long enough lever and apply sufficient force to move to a close. This approach is called “leverage marketing” or “strategic leveraging” which has become the latest buzzword in the marketing field.

Marketers with inventoritis tend to focus on relatively soft stuff like surveying customers to identify their needs and identifying or developing synergies within the product offerings. In contrast, finance people prefer to focus their efforts on finding ways to use leverage to achieve their aims - often forcefully. The Leveraged Buy-Out or LBO is an example of a powerful tool used to take over control of target

companies using other people's money so the LBO operators can restructure them to suit their financial objectives. There is much to be learned from these hard-edged financial people that can be applied to marketing. Effective use of leverage marketing tends to result in substantial or step changes to a business, not typical incremental improvements.

People with inventoritis are overly reliant on their products in defining the marketing strategy. They tend to focus on the product attributes in their approaches to marketing. Accepting marketing as primarily being the promotion of products through advertising and branding supported by the application of the well established “Four Ps” (product, pricing, promotion, placement) approach and expanded versions of this misses the mark.

There are some great leverage marketing examples. A recent one is the worldwide sweeping changeover of refrigerants used in the refrigeration industry. Traditional, ozone-depleting chlorofluorocarbon (CFC) refrigerants were banned recently as a result of a global lobby effort. An international accord called the 'Montreal Protocol' was established to stop the production and use of such chemicals that were destroying the atmospheric ozone layer. As a result, everyone was forced to replace or upgrade all of their existing refrigerators, freezers and household and automobile air conditioners. Billions of these long-lasting appliances suddenly became obsolete. This was a boon to marketers who established a position and then got behind the multinational lobby effort.

Modern marketers are catching on to the leverage marketing concept but have not yet fully embraced it. Leverage in marketing is still widely thought of as applying new technology to traditional marketing with some marketers thinking of leverage in terms of piggy-backing new offerings on existing strengths and other such synergistic notions. What is required is a more aggressive and strategic approach to marketing.

The question of “Here's the product, how do we sell it?” that often gets asked by people with inventoritis is replaced with something more constructive like “What can we offer to take the greatest advantage of

the upcoming need?" In some cases, the need can be created by the marketer who is leading or forcing changes in the marketplace, rather than responding to marketplace changes as most innovators do.

Napster, the pioneer in online music distribution, and then later Steve Jobs led the change in how music content is distributed electronically. Napster simply short-circuited the existing distribution model. Napster did not have a bonafide business model so, once it moved its lever, the recording industry reacted violently and created an avalanche. The outcome was chaos. Jobs observed the chaos, created a sound business model, found his leverage point, then had Apple's iPod hardware plus other product offerings positioned to take full advantage once force was applied to his lever.

An extreme example is the ancient and still widely-practiced approach of sending in armies to influence people's buying behaviors. A highly successful leverage marketing operation has been effected recently. Oil prices have shot up and remained above US$40 per barrel since 2004, shortly after the United States arbitrarily initiated and led the invasion of Iraq. Oil companies have made large profits since then and it was not done through a considered application of the 4Ps of marketing. Five of the 2006 Fortune 500 top 10 global corporations, as shown in the earlier section listing (#8 above), are oil companies. The current 2007 listed top ten global corporations includes six oil companies. Each of them posted good profits. Only two of these oil companies were on the top 10 list immediately prior to the March 2003 invasion. This demonstrates the power of leverage.

Marketers seeking substantial advantages need to find or create changes in the marketplace that they can then exploit. This often has little to do with product attributes. It could be a matter of beating their competitors by having the products made in a developing country at a much lower cost and then undercutting competing prices, or it could be something different like lobbying for a legislative change and exploiting it before the competition does. Technological change is a popular one that is generally overrated because too many people are looking in that direction. A marketing strategy based on a supply chain optimization like that done by IKEA as discussed in the previous section can have a huge impact.

There are three key elements required for effective leverage marketing. Product attributes have little to do with this. The three key elements are:

1. A leverage point where applying the right kind of force on a suitable lever will achieve the desired marketing result,
2. A long enough, strong enough lever to make the move, and
3. The means to apply enough force at the right time to affect the desired result.

The hardest part is usually finding a good leverage point that will allow one to maneuver in a big enough lever to do the job. It should not be something overly complicated. Finance people keep these operations quite simple. They will do something like use a large enough amount of borrowed money to make a big loan to a target company that needs money, with the simple string attached that if certain clear performance criteria are not met, the LBO group will take over control of the company. Once in control, the LBO people evict and install whoever they want and do whatever they want with the company to get maximum value out of it.

A suitable and simple enough leverage point could be a:

- **Legislative change that kills existing competing product offerings.** The banning of CFC refrigerants was a boon to manufacturers and suppliers of all types of refrigeration and air conditioning equipment, supplies and services.

- **Clear unfilled need.** Many people are taught to look for this one but it is only one of many. Too many people are looking for this one while missing other opportunities.

- **Way to severely undermine competing value propositions.** Moving manufacturing offshore, simplifying a product offering focusing on benefits rather than features or putting in a more efficient distribution system are among the common approaches.

- **Potentially disruptive technology that can give a decisive advantage.** Digital cameras replacing film cameras brought Sony and Canon into new markets and severely damaged Kodak's traditional film and photographic papers business.

- **Weapon that can be used to legally extort money from a buyer.** Oil companies and city towing companies have mastered this. They have your car unable to run without fuel or locked up in a yard respectively - until you meet their demands

- **Weapon that can be used to knock out a competitor.** Exposing fraud in a competing company's product testing and tipping off a 60 Minutes television show producer might seem a bit rough but can be highly effective.

- **Acquisition of a customer, competitor or competing product line or brand.** Maybe even perform an LBO if there is a clear fit. Many companies vertically integrate and bring in outside lines. Some even become their own competitors with multiple competing products or brands in an effort to control an entire product category.

Leverage Marketing or Strategic Leveraging involves the following five steps:

1. Determining the opportunities for improvement from the status quo.
2. Evaluating strategic improvement opportunities.
3. Creating a strategy centered on a leverage point.
4. Establishing a position.
5. Executing the strategy using sufficient leverage and force to drive the process to completion.

Innovators need to look for strategic advantages that are not product-based. Anything that will create a competitive advantage comes into play here. Control of a distribution channel, a supply chain optimization, the company size and reputation, related services offerings, location, key individuals, etcetera can be made a key part of the marketing strategy. Like Thomas Edison or Nikola Tesla a century ago, Bill Gates or Steve Jobs can walk onto a stage and give a keynote presentation that can reach a large audience and greatly influence buying behaviors.

It is critically important that the lever be big enough to do the job and that when the time comes to make the move, sufficient force can be applied. True leverage marketing is not for the timid; it is for those who are intent on moving the world. The nice thing about the leveraging approach is that there is no need to worry about overcoming inventoritis. With a suitable leverage point, a long and strong lever and the ability to apply sufficient force to get movement, the job will be done regardless of whether or not the operator has inventoritis

11. Create a Powerful Network of Outside Advisors.

The importance and value of having a powerful network of outside advisors cannot be overstated. Thomas Edison surrounded himself with the most powerful people in the world. He needed a great deal of help to develop his grand visions so he went to whatever lengths were needed to get that help. As an example of an Edison gathering, he had United States President Herbert Hoover, Henry Ford and Harvey Firestone at his 82nd birthday party in Fort Myers, Florida on February 11, 1929. It would be hard to imagine someone with inventoritis attending an event like that to not receive at least a few influential words of wisdom from one or more such people. Successful people are usually more than happy to share constructive insights and where appropriate will exercise candor if something seems off.

Corporate and individual innovators need to create a network such as Edison's that will produce relevant and candid feedback. A variety of people from different walks of life will be helpful in providing insights from different perspectives. For innovators, the network should include people from among the following:

1. Customers
2. Opinion Leaders
3. Boards of Directors
4. Industry Advisors
5. Successful Innovators

Influence should be a two-way street so one should be open to influence as well as able to influence others within the group. Jack Welch, the legendary leader of General Electric throughout the 1980s and 1990s, had developed great systems within the company for

facilitating productive exchanges throughout the organization. He was also involved with a great many leaders outside the company. Welch learned a lot from these exchanges as did all the participants.

There are many ways to get into contact with people of interest and to develop productive relationships. Something to be mindful of is that there should be value perceived by each of those involved with due consideration of and respect for people's time and attention. For example, a busy high-level CEO making $10 million a year has his or her time worth about $1,100 per hour, assuming every one of the 24 hours of every one of the 365 days is counted in. Realistically, if a workweek is 50 to 60 hours on a 50 week per year basis, that increases the hourly equivalent to about $3,600 per hour. Wasting time is not a good idea. Most busy people find ways to make time if they are interested. There are also some excellent ways to engage people efficiently through newly developing networking technologies including LinkedIn, a referral-based professional online business networking tool.

LinkedIn is just a tool, albeit a powerful one for those who know how to make it work. For those who are good at what they do, it amplifies it. For those who are poor performers, it amplifies that too. The basic rule of being of service to others is the most important one to remember. Compared to meeting someone in the real world, it is much easier to connect with someone online. The flip side is that it is much harder to develop a relationship. This should always be kept in mind and users should prepare to put in a solid effort to turn what looks like a good connection into a relationship. The key is to then connect on the phone and in person if possible. Sending an email is not going to be enough to develop much of a relationship or to get business.

No one is going to make money from LinkedIn or other online networking tools without being clear on how to use this highly effective networking tool. Turning connections made online into productive relationships is something one needs to know how to do effectively and work at. LinkedIn provides a great shortcut to make initial connections with people who can help but extra work is required to make the connection something more than an email exchange. It is important to remember that for all types of networking, givers gain.

Developing and using a powerful network of influential advisors who are able to exercise candor can be a very powerful aid to overcoming inventoritis.

12. Involve and Embrace Passionate Customers in the Product Development and Product Marketing Processes.

Bringing customers directly into the innovation process at a very early stage is not a new idea. Every architect from the dawn of civilization has been doing this. The same thing goes for everyone who has ever served as a contractor going in to do work on people's homes. Some customers become too involved, driving the architects and contractors crazy, while others do not want to have any involvement and will disappear until after the job has been done. Regardless of their level of involvement, these individuals have something in common - they are paying customers.

There is no better way to overcome inventoritis than to be doing the innovation work with real, live customers directly engaged in the process - as long as the customers themselves don't all have inventoritis. The process needs to be handled such that the innovators do not become led astray from a sound marketing strategy and down a garden path by passionate customers who do not represent a bonafide market. This should not be difficult to determine and the odds are high that a savvy marketer will not be led into the rose bushes at the end of the path by an overly zealous customer with a case of inventoritis.

This idea of involving customers directly can apply across a wide range of products and other innovations. Customers should not be made responsible for determining what products are being brought onto the market and how the business is being conducted. They should be viewed and treated as customers. For almost any kind of product, if it is of interest to anyone, there should be among prospective customers a minority who are passionate and interested enough to become willing to participate in the innovation process.

Different types of products and innovations will need different types of forums for bringing customers into the process. In the architectural scenario, the early interactions can be at an office with architects presenting plans and physical models, changing them with customer

input. Later, the models can be brought to a site office or showroom and customers can come and tour the developing site and compare the construction to the plans and models, providing input throughout the process as the job progresses.

For innovations in manufacturing processes, the factory floor and engineering offices are normal places for the customer to come and visit. For most manufactured finished goods, it depends on several variables. Small products like consumer goods can be brought around to offices or to any convenient venue while larger machinery like a railway locomotive is a little harder to move around each time but can be seen at the manufacturing location or out on a railway line. Computers form a special category of sophisticated product for which there is a convenient place where passionate leading customers gather - the amazing user groups.

A phenomenon called the computer “user group” has come into existence with the advent of personal computing. Predating the personal computer, these groups have flourished since at least 1955 when aerospace corporate users of IBM mainframe computers founded such a club. User groups are networks of clubs comprised of users of certain types or families of computers, computer software and computer applications. They have become the nucleus of where customers with extraordinary interest gather on a somewhat regular basis. These are organizations formed mostly independently of each other. They are not controlled, owned or managed by the producers of the goods, but rather are created by people interested in sharing information. Technology and friendships are a big part of what these groups are about.

There are many computer user groups. For example, there are about 700 of these groups worldwide for Apple computer people that have registered with Apple. The membership of each group varies from some having fewer than 30 members to others at over 1,000. Physical meetings are held and there are other forums for members to participate, many being online.

Computer user group members, being generally leading edge users, often become involved with trying early versions of the products and are an extremely valuable resource for providing constructive feedback as part of the innovation program. They will help to debug hardware

and software and some of these users have greater technical skill than the people responsible for the products. These highly skilled users often contribute their expertise freely and willingly on a voluntary basis to help improve the product offerings.

Users will often request certain features and benefits while questioning others. They become an integral part of the product and market development processes. In essence, these people are sociable end users who pull innovation towards higher quality by beta testing features of countless computer products - and some are budding scientists in their own right. Their activities provide brainiac developers and computer engineers and programmers with opportunities to perform their technical wizardry.

User group members are often awarded special offers, access to early releases, tradeshow passes, various gifts like coffee mugs and t-shirts, plant tours, special invitations to events and other perks to keep them interested and involved. Contests with prizes are not uncommon. The user groups also become a fertile recruiting ground for talent that can be hired. Industry media pundits are closely associated with some of these groups which then also become a conduit for public and media relations activities. User group members include some opinion leaders, former and current employees and represent a diverse range of people interested in being involved.

The user group concept has been growing into other types of products and this has become especially true for online versions. There are all sorts of blogs and other types of online forums sprouting up for different types of products. As an example, user groups or car clubs have formed for almost every type of automobile made. Some companies run contests that involve designing materials including logos and names, either directly or through these types of groups. Innovators should take advantage of these opportunities to embrace their customers.

For most types of innovations, there are ways to actively engage end embrace passionate leading customers in the product development and product marketing processes. This can happen at an early stage or long after a product has matured. Bringing customers in close can be a tremendous aid to the innovation process. Innovators would be

remiss if they did not consider this approach. Having customers directly involved like this is a sure fire way to overcome inventoritis, as long as the customers themselves aren't all afflicted with it.

The above 12 ways are intended for those who are interested in achieving commercial success and maximizing profits. There are many settings where making money is not a primary or relevant concern where these ways can still become quite useful. University researchers striving to gain a deeper understanding of our universe and natural laws are among those can benefit. Hobbyists and part time practitioners can likewise apply them to their particular circumstances as they work toward meeting their project goals. It is not an all or nothing proposition. The key is to use them wherever they make sense to incrementally increase the success rates for inventions and innovations, however success is defined.

Chapter

8 The Successful Inventoritis-free Innovation

Winning innovation processes only become possible once inventoritis has been properly addressed and dealt with. This can result in more predictable outcomes and greater returns on these important investments. Replace the uncertainty and pain of failed innovations with the joy and satisfaction that comes with operating a highly successful, inventoritis-free innovation process.

It is surprising that it has taken centuries to come up with a name for this terrible condition. Although nameless, it had the face of brilliant scientist and inventor Nikola Tesla, the father of alternating current electricity, radio and other great inventions.

The good news is that Thomas Edison fully understood this condition and avoided it throughout his long and productive life. He achieved commercial success with almost all of his inventions described in over 1,000 issued patents. He ushered the world into the age of electricity, turning night into day, while building numerous successful enterprises including General Electric, which to this day remains as one of the greatest companies in the world.

Edison was always a source of inspiration to Henry Ford who pioneered the mass production assembly line now being used throughout the world in many industries. Ford also understood the damage that inventoritis can cause and tried to avoid it while developing his company into what has also become one of the largest companies in the world. He was not always successful in avoiding it. There were times he came down with it, such as when he failed to let go of the Model T and give car buyers more styles and models to choose from. That mistake cost Ford its leadership position and allowed Alfred Sloan to move General Motors ahead of Ford where it has remained ever since - until this year. Now Toyota has taken the lead with its lean manufacturing process that tends to be much less prone to inventoritis than the mass production approaches pioneered by Ford nearly a century ago.

Nikola Tesla is also celebrated as a great inventor and scientist, some say the greatest since Leonardo da Vinci. Unfortunately, having eventually lost touch with the market, Tesla came to a sad end. He became withdrawn and although he had interesting things to say in his later years, he had no marketing strategy. He had developed a severe case of inventoritis and as a result had little to sell that people wanted to buy.

Edison employed Tesla who later left and rose to great heights in developing inventions the market was eager to receive. But he then turned his back to the market and started down a long precipitous path toward ruin. Tesla's severe case of inventoritis had also caused him to turn against Edison, enjoining him in a highly publicized, winner take all battle to the finish known as the War of the Currents, which pitted Tesla's AC electrical system against Edison's established DC system. This battle was a costly one for all those involved, especially Tesla.

Tesla may have won the battle in part but he lost the war as he became obsessed with his visions of interplanetary communication, global wireless electricity, death rays and a machine that could literally split the earth. Tesla turned his back on the market and failed to commercialize products such as fluorescent AC lighting and radio communications that he had already invented. He cheated his investors, alienated the media and even got thrown out of his own company in about 1887.

Tesla had knowingly become branded as a mad scientist as he self destructed. He essentially died of inventoritis, lonely and broke with his main companions being wild pigeons that came into his room at the Hotel New Yorker. Edison, meanwhile enjoyed a long, prosperous and productive life and died among family and friends with the entire nation dimming its lights for a minute of remembrance.

The extremely successful Edison Method of Marketing has been largely ignored yet has always been in plain sight for those knowing what to look for. So has the Tesla Death Ray Method of Marketing. But a powerful irony has gripped and deceived innovators and marketers up to the present day: Unknowingly, they have embraced the destructive Tesla (inventoritis-infected) method in the marketing of new ideas and products.

Present day innovators need only contrast these two radically different approaches to see how destructive inventoritis can be to the marketing process. Microsoft cofounder and chairman Bill Gates has applied the well proven Edison methods with great success, recently becoming the world's richest person and building Microsoft into a great global company. Ironically, his main rival, Apple cofounder Steve Jobs, had inventoritis and started down the same path as Tesla did, battling Gates and getting thrown out of his own company in 1985.

The Macintosh/Windows user interface battle mirrored the AC/DC electricity system battle from a century earlier. Fortunately, unlike Tesla, Jobs did not turn his back to the market. He overcame his inventoritis, made up with Gates, cleaned up the mess and is again leading Apple which is commercializing wonderful innovative products that customers can't get enough of. It looks like Jobs will be marketing “killer apps” rather than “death rays” and talking to people rather than to wild pigeons.

People with inventoritis may be easily fooled into identifying with Tesla and the early stance of Jobs; viewing them as victims rather than the architects of their respective downfalls. However, serious marketers will identify with Edison and apply the well-proven Edison Marketing Method to their work. Gates and his team do not have serious inventoritis problems. Gates applied Edison's approaches and, like Edison and Ford, founded a company that grew into a global giant. It seems Gates even picked up Edison's effective media relations habit

of preempting his competitors by occasionally announcing products before they materialized. In any event, the Edison method is sound, although it can only be applied by persons who do not have inventoritis. That remains a non-negotiable requirement.

Company owners have been remiss in giving corporate managers an excuse for failing to perform in the face of potentially disruptive technologies. Rather than force management teams to look inwardly for the causes of their innovation failures, managers were allowed to blame externalities such as marketplace or technological changes that could be described as disruptive. There is no need to look for externalities to cast blame upon for a company's failure to constructively respond to marketplace changes. In short, inventoritis is disruptive.

Applying sound marketing principles such as fully understanding the market and the competitive landscape within which a company is operating, as Edison and Gates did, is an important part of addressing changes in the marketplace. That understanding gives companies the basis for seeing potentially disruptive technologies and acting before it becomes too late. Among their options, companies can get out of the way, embrace the new technologies or put in place product offerings at predetermined or calculated thresholds that function as firelines. These serve to protect established players from being burnt out of their markets by disruptive innovators. In the case of hybrid railway locomotives, General Electric established a fireline and effectively turned this potentially disruptive technology into one of its own sustaining technologies where R&D resources can be applied rationally as the market comes to fruition. Kodak managed to deal with the advent of digital photography that is still in the process of turning the traditional markets for its photographic film and papers into ashes. This can only be done effectively by people who have a good perspective and are not blinded by their inventoritis.

There is more good news. Once inventoritis has been diagnosed, there are several ways to treat and overcome it and achieve a successful innovation outcome. These include the 12 ways presented in the previous chapter. These should be applied while keeping in mind the main point that organizations need to treat the inventoritis in their people, then train them to be on guard for it since there is a natural tendency for this terrible condition to grow and fester if left unchecked.

An organization that frees its people free from it can simplify its innovation processes while managing them for greater results. Remember, there is no cure, although it is quite treatable.

Inventoritis issues affect all types of innovators, from the lone inventor trying to market his or her first invention to the world's largest corporations with their massive R&D centers. There is little or no need to differentiate between product or service oriented companies. Nor is there a need to consider the size or type of organization when considering the potential for inventoritis to adversely impact the performance or returns on resources applied to innovation activities. What matters is knowing that the impacts can be very large and that identifying and treating the disorder are crucial in order to achieve better performance and returns on investments made in innovation.

Booz Allen Hamilton completed a 2005 study of the top 1,000 global R&D spenders, finding no correlation between R&D spending and sales growth, operating profit or shareholder return. That is a shocking conclusion in light of the fact these large companies typically spend 1 to 15% of their gross revenue on R&D. There simply needs to be a higher rate of success in these activities. One way to achieve that is to protect companies and individuals from their own ideas based on their own unhealthy biases. Innovators need to avoid wasting valuable resources on things that should not be going into the pipeline. They also need to aggressively apply resources, through proper leadership, where it is strategically advantageous to do so. Great innovation demands great leadership.

Owing in part to inventoritis issues, marketing, which is the process of anticipating, identifying and satisfying customer requirements profitably, is not well understood and leadership and management roles are poorly defined and somewhat muddled. This is fixable although it means reworking the traditional corporate model and having it better aligned to suit both Edison's early approach and the newly developing one. Some companies, including Microsoft, have solved this problem by inventing a new type of leadership and management structure for the innovation process. At its core, there must be clear leadership of the R&D activities coming from the marketing strategy center. The bridging from marketing to engineering and sales must be solid and no one with inventoritis can be allowed to lead the marketing.

Innovation can become a rational and predictable process. Edison's was. Microsoft's is.

Impacts and Opportunities

Thomas Edison's excellent marketing abilities and approaches were never widely reported. Henry Ford learned them directly from him and made good use of them in building his massive global car business. General Electric and others from among Edison's original companies today are still among the greatest in the world. A large part of the Edison method was also employed by Bill Gates and his Microsoft team. The key is being able to ensure that R&D initiatives follow and do not lead the marketing strategy. It is also important to ensure that people in the strategy area and those leading the R&D effort do not have inventoritis. Or, if it is identified in a company or its employees, that this condition receives immediate treatment. There are emerging tools, based on success stories from history and from effective leadership and management structure adaptations being modeled today.

The most important thing to do initially is to develop a sound 'innovation psychology', one free of inventoritis. Edison did not do this in his day and to date no one has made much work of the psychological aspects of innovation. No amount of good analysis applied to innovation will yield much benefit so long as there are unresolved psychological issues. Overcoming inventoritis is essential for achieving improved performance of the innovation process from ideation to deployment.

A three-pronged strategy can be applied to a company's R&D activities. First, R&D spending should be carefully directed toward the areas that will yield higher gross margins. Second, the marketing strategy should always lead the R&D initiatives and not the other way around. Third, there needs to be a bonafide marketing strategy center with solid bridging to the R&D center and the sales area. With this apparatus in place, the R&D expenditures can be determined rationally as they relate to gross profit margin improvements.

The bridge-building opportunity is very important. By having the people and budgets properly aligned between the marketing strategy center and R&D center, potentially disruptive technologies can be assessed and channeled. Adjustments can be made to marketing strategies so that the R&D center will concentrate on relevant initiatives. This practice will help to avoid irrational decision-making about investing and divesting. Furthermore, it will allow companies to embrace properly directed and effective marketing intelligence flow, establish firelines to prevent any true disruption and aggressively move forward on initiatives where there is a clear strategic advantage. Training everyone in the organization to become and remain inventoritis-free will make it much easier to build these bridges, while helping everyone to understand why such bridges need to exist.

By ensuring anyone with inventoritis gets checked at the door or obtains treatment, companies will be able to simplify their innovation processes and increase the returns on their substantial R&D investments. It is important to ensure that anyone with inventoritis be treated of this condition and if untreated, be kept out of the leadership of the innovation process. If everyone in the organization is trained to recognize and treat it, then that is even better. Toyota has done this to a certain extent as part of developing the highly touted “Toyota Way” manufacturing philosophy and processes.

Building solid leadership bridges between the marketing, engineering and sales areas and ensuring the R&D activities are led from within the marketing strategy area will limit the influence of inventoritis and help companies achieve better returns on their important investments in innovation. As a result of being able to apply R&D spending more rationally, a higher percentage of innovations will become commercial successes.

For lone inventors and corporate innovators alike, commercial success is the primary goal. This requires being an effective product marketer and improving the processes to incrementally increase the success rates. That can only happen in an inventoritis-free environment.

Appendix

A Case Study: Thomas Edison vs. Nikola Tesla in the "War of the Currents"

Thomas Edison's Rise to Prominence

Thomas Edison got his start in business at an early age. He did not like working in the family garden so he found other work in 1859 on the Grand Trunk Railroad that was newly extended through his hometown of Port Huron into Detroit. He enjoyed selling candies, newspapers and magazines and was quite good at it. It was not long before he started hiring other boys to sell magazines and also vegetables in Port Huron while he worked on the train route. He created his own newspaper called the Grand Trunk Herald, the first ever published on a train. He wrote, printed and sold it from onboard the train.

Edison greatly valued his experience from 1863 to 1868 as an itinerant or "tramp" telegraph operator, traveling from city to city plying the trade. Telegraphers such as Edison were in a particularly good position to gain insights into the fields of politics, journalism and business which relied on this very important mode of communication in the years before radio and telephone came into existence. As a telegraph operator, he learned what was important to the politicians, what news was to the journalists and

what business was all about. He built an extensive network of relations in each of these areas.

Some of his fellow telegraph operators became newspaper reporters who helped push Edison into the public eye. He spent much time with journalists and editors, frequenting their offices and participating in many late night conversations. He made friends and encouraged them to come and visit his lab where he always had something to show and tell.

Edison also spent considerable time and effort cultivating relations with powerful people. He developed close ties with Western Union President William Orton and with Marshall Lefferts, who was President of Gold and Stock, another large telegraphic firm. These two individuals served as his mentors while their companies supported his business. Lefferts died in 1876 and when Orton died a couple years later, Edison declared “If I get to love a man he dies right away.”

Later, Edison, Henry Ford and Harvey Firestone (founder of Firestone Tire & Rubber Company) were generally considered the three leaders in American Industry at the time and they formed a tight group that was part of an exclusive group called 'The Millionaires Club.' These three often worked together and their families vacationed together. They knew each other so well they would do each others bidding for purchasing buildings and other such activities without much by way of formalities.

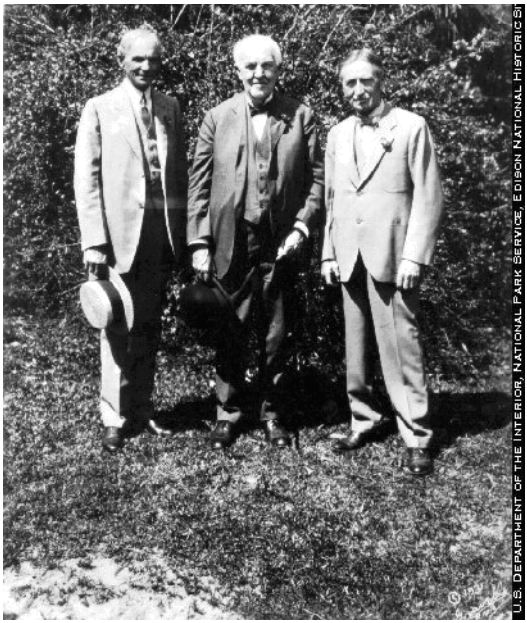

Figure 3: (L-R) Henry Ford, Thomas Edison & Harvey Firestone. Courtesy U.S. Department of the Interior, National Park Service.

Edison had many relations with powerful people and would not hesitate to call upon them for guidance or to persuade them to do something for him. Edison also had a great ability to identify, acquire, harness and motivate talent. He managed to acquire and hold the brilliant Nikola Tesla until two competing backers induced Tesla to leave the Edison Company.

Edison learned the power and importance of public relations and media relations during his time on the railroad selling newspapers and later working for years as a telegraph operator. He also read everything in the Detroit Library on these subjects along with reading about subjects of the utmost interest to him. He was interested in almost every subject that was ever written about. At his Menlo Park laboratory, although he

was normally in the workshop with his team, he fashioned a special office as part of his public image control strategy. In a nutshell, he was extremely media savvy.

Figure 4: Edison's special office as currently preserved at the Edison National Historic Site in West Orange, New Jersey. Courtesy U.S. Department of the Interior, National Park Service.

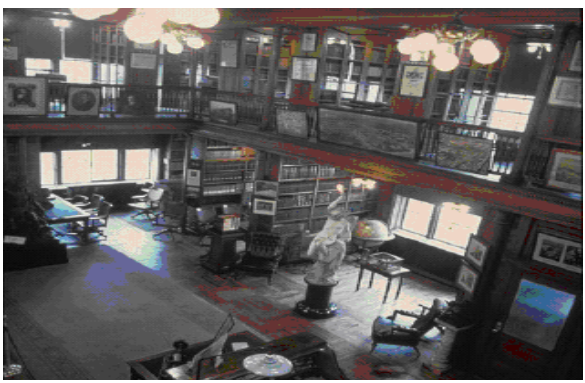

Figure 5: Another view of Edison's special office as currently preserved at the Edison National Historic Site in West Orange, New Jersey. Courtesy U.S. Department of the Interior, National Park Service.

Publicity campaigns including photo opportunities were well staged and he had press kits including first rate photographs available at all times. Notice in the two images, the table, chair, tablecloth and Edison's suit are the same but the two 1878 photographs were staged differently. He had well-lit photos taken with his investor Uriah Painter and colleague Charles Batchelor as well as solo photos. He recognized the importance of these types of images that were expected to be and in fact were widely circulated, for well over a hundred years now. The April 18, 1878 morning photo session was arranged by Painter and conducted in the Washington DC studios of Mathew Brady with Edison in a new plaid suit on the same day Edison was presenting his tin foil phonograph invention to the annual spring meeting of the National Academy of Sciences. Brady was the top American photographer of his time.

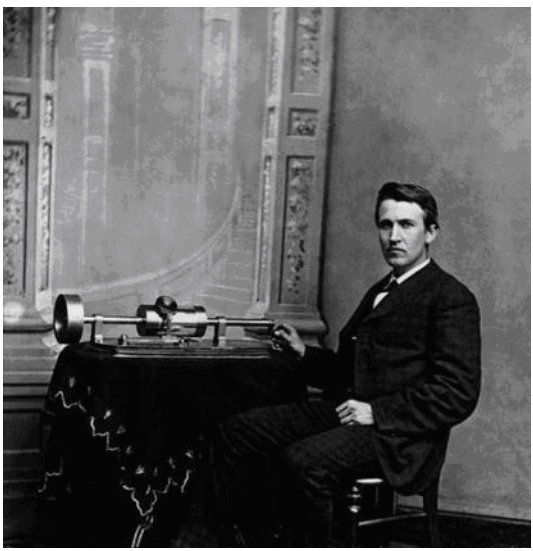

Figure 6: April 18, 1878 photograph of Edison and his tin-foil phonograph in the Washington DC studios of Mathew Brady on the day Edison was to present his invention to the National Academy of Sciences. Courtesy U.S. Department of the Interior, National Park Service. M. Brady photo.

Figure 7: April 18, 1878 photograph of Edison and his tin-foil phonograph along with investor Uriah Painter and colleague Charles Batchelor on the day he was presenting his invention to the National Academy of Sciences. Courtesy U.S. Department of the Interior, National Park Service. M. Brady photo.

Among Edison's numerous great publicity campaigns were the ones used to promote the lighting business. He knew the incandescent lamp would be useless without large scale power production and distribution systems to bring electric light to the consumers. To do this, he built the first commercial power plant in Manhattan. It was designed to cover the few city blocks that housed the major American newspapers, the New York Stock Exchange and financial houses including J.P. Morgan, an investor in his company. To help create demand for the product, he put on various campaigns with the most audacious one being something

he likely learned from P.T. Barnum, who is now known as the 'Shakespeare of Advertising.' Edison had 400 men with lights on their heads powered by a horse-drawn generator form a parade through Manhattan. They each had wires running down their sleeves linked to the mobile steam-powered electric generator.

Edison investor Uriah Painter in 1878 arranged for P.T. Barnum to visit Edison at Menlo Park. Barnum was already a fan of Edison by that time. There is little doubt that Edison learned from Barnum and made good use of the famous master showman's ideas and approaches to generating public interest in products and ideas.

Barnum is commonly believed to be the first person to have used a voice recording for advertising purposes. While in London in 1890, a year before he died, he recorded a voice advertisement praising and promoting his world famous circus on Edison's early phonograph, then still known as a voice recording machine.

Barnum, the self titled 'Prince of Humbugs,' was a master of self promotion and the greatest showman in America. He claimed that “every crowd has a silver lining” and spent most of his life proving it. Edison had an excellent role model in Barnum for designing his own ad campaigns and to inspire him to develop products useful for advertising such as the Edison Dictaphone he invented and marketed in the early 1900s. He brilliantly and quite successfully used his motion picture inventions to make the film “The Stenographer's Friend” to promote the Dictaphone, effectively promoting both technologies. By doing so, he also pioneered using film as an advertising media.

Another one of Edison's positive attributes that barely receives mention in most of the historical writings is that he was a people person. He was fun to be around and most people enjoyed being with him. He certainly worked long and hard in his technical areas but he was not a recluse and he knew how to handle himself in public. The workshop environment was convivial and while the work was often difficult and sometimes tedious, it was the place to be - a hub of activity known throughout the developed world as a place where exciting and great things were happening. Edison was always ready to share a good joke and interested in learning new things from virtually anyone who had something interesting to talk about.

Edison was inspirational and his leadership abilities were never in question. Henry Ford already viewed him as the “greatest man in the world” when they had first met and, after 34 years of knowing him personally, wrote in his 1930 book[23] 'Edison As I Know Him' that Edison had a “capacity for hard working and hard thinking” that stood out in Ford's mind above everything else “a wonderfully imaginative mind and also a most remarkable memory.” Ford also claimed Edison had within him a “driving force that pushes him on continuously and regardless of everything until he has finished that which he started out to do. He will not recognize even the possibility of defeat. He believes that unflinching, unremitting work will accomplish anything. It was this genius for hard work that fired me as a lad and made Mr. Edison my hero, and all these years of knowing him have only strengthened the hold that he had gained on me long before I ever met him. I often think how pleasant an experience has befallen me, in that my boyhood's hero became my later manhood's friend.”

Edison also possessed the special quality of being a servant-leader. Ford wrote “I have come to know him, I think, rather intimately, and the more I have seen of him the greater he has appeared to me - both as a servant of humanity and as a man.”

Edison lived his life in the company of many of the greatest leaders of the times with Henry Ford not being the least among them. He also had many of the brightest minds from around the world concentrated around him and working at a highly productive level for a great many years. Tesla was among them for a while. Edison is still widely held in esteem a century later and his brilliance is indisputable by any reasonable person.

Edison lived long and prospered in virtually every way until his death in 1931 at 84 years of age. He is the greatest product marketer the world has ever known.

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23. Ford, H. & Crowther, S. (1930). Edison As I Know Him. New York: Cosmopolitan Book Corporation. (pp. 13-14).

Nikola Tesla's Rise and Fall

Much like Edison, Nikola Tesla worked tremendous hours, typically starting his day at 3 a.m. and finishing it at 11 p.m., seven days a week. He first worked for Continental Edison Company in Paris in 1882, constructing his first induction motor (one of his greatest accomplishments) in the after-hours the following year while on assignment to Strasbourg.

In 1884 Tesla went to the United States to work for the Edison Company to redesign Edison's machines. They had a falling out over a $50,000 bonus Edison told him he would receive. Tesla was going to use the money to go out and set up his own laboratory in competition with Edison. Edison was delighted with the results of Tesla's work but did not pay Tesla the bonus, telling him “Tesla, you don't understand our American humor.” Two competing backers, James Carmen and Joseph Hoadley, induced Tesla to resign from Edison's operation and set up shop for himself under the name Tesla Electric Light Company.

Tesla's first foray into business did not work out as well as expected. Carmen and Hoadley took over the company from Tesla and booted him out after a major disagreement on what the company's technological and marketing strategy would be. The dispute was centered on Tesla wanting to use unproven technological approaches, while the others insisted upon a more conservative approach using existing technology to meet the growing demand for electric lighting.

After a difficult year during which Tesla worked as a street laborer digging ditches, he signed up with George Westinghouse, who bought all his patents for $60,000 of which $5,000 was in cash and the balance was in the form of 150 shares of Westinghouse stock. He also contracted to receive $2.50 for every horsepower of electricity sold. This proved to be a very lucrative arrangement with Westinghouse generators being installed in various places, including the huge Niagara Falls system for Buffalo in 1895. Tesla was able to work on interesting projects and had impressive labs during the years in Westinghouse's employ. He became famous in the process. Tesla and Westinghouse parted ways in about 1898, so Tesla went out on his own. A decade later, in 1907, when Westinghouse was weakened in

the financial panic of that year, Tesla accepted a buyout of his residual Westinghouse royalty interests for $215,000 which was a hefty sum in those days.

It did not take long before Tesla got himself into some difficulties. He squandered the Westinghouse money and was soon looking for other sources to fund his laboratory and ideas. He was well enough known that he was able to gain access to some of the most prominent people in American industry. He had a track record of great early successes to work from so it was not difficult for him to generate interest in his projects and ideas. Unfortunately, Tesla's projects were ill-conceived from a marketing perspective. He was using commercial money to fund non-commercial activities while claiming the activities to be commercially viable projects. He was traveling down the road to ruin at an increasing pace.

Tesla got himself into serious problems by cheating J. Pierpont Morgan, the most powerful financier in the world. Tesla wanted to build a wireless electricity transmitting tower on Long Island to distribute electricity in a very questionable way. It was technically very uncertain and there was no sound business model. Westinghouse turned him down on his proposals so Tesla convinced Morgan to fund a plan to send wireless messages to Europe. Tesla did not tell Morgan his real ambition.

Morgan bought into the wireless messaging proposal and agreed to give Tesla $150,000 ($50,000 more than Tesla asked for), with Tesla to have 49% of the company and Morgan to have 51% (Morgan had offered an even split) and Morgan to also receive a split of the patents as well as the company (which Tesla did not like since he proposed Morgan only take a percentage of the company). The contract was agreed upon in February and signed in March 1901.

Morgan left for London and was looking forward to receiving reports of yacht races and to sending wireless messages to ocean steamers. This was a small deal for Morgan who was in the middle of organizing the U.S. Steel trust at a cost of $1.5 billion. Instead of receiving wireless yacht reports, Morgan was seeing press reports of Tesla's claims of interplanetary communication. In 1904, Tesla wrote to Morgan “I could not report yacht races or signal incoming steamers. There was no money in this. This was no business for a man of your

position and importance." The idea of radio communication was of great interest and Tesla had invented it some time prior but had not developed it. Since Tesla was not doing it, Guglielmo Marconi went ahead and developed radio communications to fill the growing demand and interest in the area.

Tesla was spinning out concepts for interplanetary communication, global weather control machines, artificial daylight in the skies to illuminate shipping lanes at night, wireless power systems to run the London trams and light for the whole world. Morgan was busy working on huge billion dollar deals and stabilizing global financial markets while Tesla was going off on these various tangents and asking for more money. Tesla failed to deliver on his promises and was sending all sorts of petulant letters to Morgan who cut him off in October 1904.

In order to perform his wild high voltage experiments, Tesla built an additional special lab in Colorado Springs, Colorado, from where he was blasting millions of volts into the earth's surface. This was in an attempt to create what he called a "resonant rise" that would go through to the other side of the planet and bounce back. People were hearing his thunder several miles away and he even blew up the Colorado Springs power generator. In town, when Tesla was experimenting, sparks would come out of the ground as people walked and the fire hydrants would shoot lightening bolts toward nearby metal objects. While Tesla was in Colorado Springs working in his high energy lab, Marconi had stolen Tesla's invention of radio, made it work, garnered the headlines for it and had become famous.

Tesla was developing a reputation as a mad scientist. Edison would have nothing to do with him. Morgan cut off the money. Westinghouse was done with him. He was incompetent in financial matters, unconcerned about the practicalities and marketability of his products or ideas, as egotistical as he was brilliant, and generally a difficult person to deal with. Tesla admitted that Morgan "carried out his generous promise to the letter and it would have been most unreasonable to expect from him anything more." Tesla also claimed his projects were "too far ahead of time." He was unable to relate to women or to most people and he tended to be emotional and unpredictable. He was killing his media opportunities by giving them nothing of commercial value to report on, while dazzling them with material to support the mad scientist image he was developing.

Furthermore, Tesla's obsession with interplanetary communication is something he clung to for 40 years until his death in January 1943. Tesla started pushing the idea of death rays as he aged and there is a story of his having tested his invention on June 30, 1908. Just prior to his death, news of his activities was finding its way onto America's newspapers, not with reports of new commercial successes, but with his ideas and designs for communication with other planets, wireless global electrical energy and promotion of his gloomy philosophy of war including his death rays and a machine that could literally split the earth.

Tesla died a broke, paranoid, miserable, lonely man who in his last years was holed up in the Hotel New Yorker having dialogues with a flock of pigeons he had enticed into his room. Discredited in his time, Nikola Tesla was made out by his business competitors and others to be little more than a kook with some good technical abilities. In contrast, when Edison died, the President of the United States asked everyone in the country to dim their lights for a minute of remembrance, a practice that was widely observed.

Even today, Tesla is widely portrayed as a victim, kept or displaced from prominence by a conspiracy including Edison and the other powerful people who were running American industry. Both these great men had their faults and they each have fans and detractors today. Tesla's fan club is a vocal and diverse one including many scientists, engineers, advocates of free energy and anti-establishment people who consistently view him as a victim of outside circumstances rather than a brilliant scientist and engineer but lousy marketer. Few of Tesla's fans view the marketing field as being a highly valuable discipline.

The War of the Currents

The story of the competition between the DC and AC electrical technology became a very public display of Edison and Tesla coming to technological blows. It is also interesting because it provides insights into how Edison was able to market a relatively poor product as compared to Tesla's. At the end of it, the AC power system had been

deemed more dangerous yet technically superior for it prevailed in having the ability to cost-effectively transmit electricity over long distances.

But Tesla did not prevail over Edison in the long run. Edison lived a long prosperous life while Tesla, who lived even longer, did so in relative poverty and in ever-increasing isolation. The competition between these two brilliant men over competing technologies dubbed “War of the Currents” became a very intense and personal one.

The most popular, simplistic version of the story has Edison and a George Westinghouse-backed Tesla pitted against each other in a winner-take-all battle to the finish. F. David Peat, a physicist working for Canada's National Research Council, was tasked by the Council president in the early 1980s with researching Tesla's work and preparing a report as requested from the Research Council by Canada's prime minister. Subsequent to completing the report, Peat published in 1983 his book titled 'In Search of Nikola Tesla' [24] which has a fairly good description of the DC versus AC technology battle as has been popularly understood and accepted. The relevant passages follow:

> Towards the end of the century Thomas Edison had cornered the market in the commercial development of electrical power. With the opening of his public power station on September 4, 1882, in New York City, the Edison system seemed destined to be installed in every American town. Edison himself had developed a power generation and supply system which was based on low voltage direct current (DC) and even in the face of Tesla's new invention he was clinging stubbornly to his original ideas.
>
> The main problem with direct current supply at the turn of the century was that it could only be generated at low voltages. Unlike alternating current (AC) which can be stepped-up by transformer, DC could not be increased in voltage.
>
> Modern transmission lines carry electrical power at high voltage for the simple reason that the higher the voltage the lower the losses due to line resistance. In the Edison system resistive losses were so high that power could only be transmitted over fairly short

24. Peat, F.D. (1983). In search of Nikola Tesla. Bath:Ashgrove

distances. Each city was required to have its own power station and there was little hope of electricity being taken to outlying districts or small villages.

Edison's major rival was George Westinghouse who had realized, as Tesla had done, that AC power could be stepped up to very high voltages by transformers and then transmitted at very low loss. In 1886 Westinghouse constructed a test transmission line in which current at 33,000 volts was carried a distance of 4,000 feet.

Edison for his part refused to move; his giant corporation was committed to DC power and he forged ahead building improved generators and transmission lines. He felt confident in his position, for he knew that his own system had been tried and trusted by satisfied clients, while the Westinghouse generators were far from successful. The great American inventor was by no means the lone reactionary when it came to high voltage AC power, for the International Niagara Commission headed by the leading physicist of the day, Lord Kelvin, had decided in favor of DC.

Edison had placed all his corporate eggs in the basket of DC power and now he was faced with a rival system. To make matters worse, he had once been offered the chance to buy Tesla's inventions before they had even been patented.

In the heat of the battle Edison wrote, in the North American Review for November, 1889:

> My personal desire would be to prohibit entirely the use of alternating currents. They are as unnecessary as they are dangerous.

Edison was a showman and having the town lights switched on by Thomas A. Edison was an event to remember. The town of Anaheim, California, for example, celebrated its new Edison system with concerts, marches and displays. The Grand Talking Machine, Edison Moving Picture Machine and Minescope featuring Dr. Eugene Sandow The Modern Hercules were displayed. The current itself was turned on by Mr. Charles Lorenz, the oldest living resident of Anaheim and the magical day was celebrated by a concert involving recitations and whistling solos.

Edison must have realized that whistling solos alone would not be sufficient to win the day against a superior system, so he looked around for another point of attack. It was provided when, ironically,

the Edison Company installed, under license, an electric chair in Auburn State Prison in 1890. The world's first all electric execution proved a messy affair. It did not go unnoticed by the press that 'Tesla current' was used. The inference was obvious, if AC can be used to dispatch dangerous criminals, is it really the thing to have about the home? AC power is hazardous, Edison had said, and far too lethal to bring amongst the women and children.

An attack which focused on the safety of Westinghouse's system was a master stroke, for it totally ignored economic and scientific arguments, on which score Edison was bound to lose. How could Westinghouse reply to the accusation that he was endangering the safety of American homes? His position seems not unlike that of the directors of nuclear power associations today who must deal with charges of radiation hazards and possible nuclear accidents. No matter what they say, they are lost, for the public is suspicious of any attempt to deal with the issues which remotely looks like a cover-up or a minimization of risk. Even if safety arguments look good on paper, can an individual afford to take the risk?

Tesla's counterblast in the 'War of the Currents' was even more brilliant than Edison's attack. He made no attempt to answer the arguments or present an analysis of the risks involved. Instead he walked out of his laboratory and on to the stage. Nikola Tesla became a bigger showman than Edison. In lecture halls and exhibitions, Tesla assembled his electrical apparatus and barnstormed for AC. His displays must have been spectacular, even by today's standards. He produced enormous flashes of lightning across the stage, he activated machines which flashed and cracked and, at the high point of his act, allowed enough current to pass through his body and light a row of electric lamps.

From his earliest days Tesla had been inspired by the vision of harnessing nature's powers - waterfalls, rivers and winds. With the Edison system, a waterfall powered generating station was quite possible but there would have been enormous losses in transmitting the current to nearby towns. With Tesla's high voltage AC generation, the power could be transported across the continent if necessary. His vision, when it came to electrical power, was unlimited and he was determined to win the War of the Currents against Thomas Edison.

Peat's review was not kind toward either Edison or Tesla and cast Edison in a particularly harsh light. This remains a popular view with Edison vilifying Westinghouse as a “shyster,” the rival company as “the enemy” and Edison's animal electrocution demonstrations as being strictly self-serving. That the Tesla/Westinghouse AC technologies won the day was confirmed by Edison having eventually switched over to AC after, as Peat wrote, “clinging stubbornly to his original ideas.” The fact that Edison did eventually make the switch confirms his ability to accept what the market teaches or dictates even if it opposed his beliefs and entrenched interests. This is something that people with inventoritis are normally quite unable to do.

A closer examination suggests a different Edison, with a broader and more practical perspective from the one portrayed above. Throughout the duration of the DC versus AC debate, Edison was cross-licensing AC and DC technologies, following and investigating the AC developments in Europe and elsewhere, and seeking opinions on the relative pros and cons of the two systems. He was filing patents on AC technologies to regulate voltages of AC systems and to reduce the energy loss from transformers used with them. He was also working on converting AC to DC to run DC electric street railway motors. Edison had maintained his perspective and remained in tune with the market.

There was no reason to conclude Edison's concerns for safety were not bonafide since he was thus concerned from the beginning of the electric lighting industry. He used the greater safety of electric lights as an argument in competing with the entrenched gas lighting industry. He demonstrated that all parts of the low voltage DC systems were safe to the touch, even the poles of the generators themselves.

In contrast, even in our modern times dominated by AC power systems, people are often injured or killed in electrical accidents. Additionally, his argument that Westinghouse was putting people at risk primarily to reduce the copper costs was not entirely without merit. Edison also failed to adopt a high voltage DC power system, choosing instead to keep the DC voltage low. He believed high voltage DC was safer than AC but knew it could still produce a fatal accident that might turn the public against his system. He instead directed his attention to other areas including improving his lamps where safety was not an issue.

One advantage was that the lamps were common to both AC and DC systems. Tesla did not take the opportunity to develop a lamp business although he had an excellent opportunity to do so. Fluorescent lights work by using AC electricity to excite mercury vapor in argon or neon gas, resulting in a plasma that produces short-wave ultraviolet light. This light then causes a phosphor to fluoresce, producing visible light. Tesla had these high tech lamps on display in Chicago in 1893 at the World's Fair. The world's lighting systems are currently switching over to the much more efficient fluorescent systems. Incandescent lamps of the type made for over 100 years based on Edison's relatively low tech designs are now generally being phased out.

Tesla completely missed this opportunity to develop his technology for which there was a ready market. He left it on the table for over 30 years and eventually in 1926, German inventor Edmund Germer and his group came along to independently finish the job. Ironically, General Electric bought Germer's patents and started producing fluorescent lamps creating what became and still is a very large and growing global business.

With the benefit of over 100 years of hindsight, perhaps Edison and Lord Kelvin were correct in their opinions that DC rather than AC power systems should have won the day, at least at the consumer level. For primary power generation, transmission and distribution over large distances and for industrial applications, the AC power system would have been superior as it is today. However, there are high-current DC transmission links increasingly being used to transmit very large amounts of electrical energy although they are more difficult to switch and operate than AC links.

As it stands, most low power applications and practically all devices containing batteries (laptop computers, automobile electrical systems, personal communication devices, electric shavers, portable radios, flashlights, etc.) use DC power. Ship and railway power systems typically employ low voltage DC for lighting and other needs with most today using higher voltage DC for their propulsion systems.

Edison appears to have had limited inventoritis since he did not move toward a strategy combining the best elements from each of the AC and DC technologies. If Tesla would have maintained a productive relationship of some sort with Edison, the world would likely be a better place for it.

It would cost trillions of dollars today to make a switch but we would likely be much better served today if electrical energy was delivered to our homes as high voltage AC, transformed to one or more lower voltages, then rectified to DC for our domestic needs. It would be much safer and we would be able to have better back-up systems such as storage batteries in the event of power failures. We would also be in a better position to have onsite and more widely distributed power production and cogeneration systems to simultaneously cover our domestic electrical plus heating and air conditioning needs.

The development of transistors and microelectronics would likely have been greatly accelerated with there being such great demand for electronic inverters, frequency converters and the like for operating low cost and low maintenance induction motors at varying speeds. Electric and hybrid electric cars would have had a greater opportunity for earlier development. We might not have the primary power generation system worldwide composed as it is today of mainly huge, highly inefficient power plants which dump most of the energy they consume from the fuel back into the environment as waste heat.

This suggestion that Edison's DC power systems should have come out ahead might seem like heresy today with the whole world having centered around 50Hz and 60Hz AC power systems. It appears what little inventoritis Edison had within him at the time might have prevented him from quickly adopting such a combined AC/DC strategy.

Working together, the younger Tesla could have built on the knowledge, experience and base established by Edison, learning from the example much as Henry Ford did. Tesla instead chose to stay on an adversarial path for which he paid dearly. There is no doubt that the world would have benefited even more greatly if these two brilliant gentlemen would have been able to cooperate and combine their talents, thereby avoiding the costly and counterproductive “War of the Currents” - for which we are still paying a price.

Appendix

B Lessons from Edison vs. Tesla

“Genius is one percent inspiration and 99% perspiration. As a result, a genius is often a talented person who has simply done all of his homework.” This is Thomas Edison's most famous quote. Historians and journalists have almost always held this in the context of his laboratory and seem to forget that a large part of his efforts were invested in product marketing - outside of the scientific work being conducted in the labs.

Edison never lost his focus on doing his homework to understand the market. He also never overlooked the players (e.g., customers, suppliers, and competitors) in the market. Finally, the financial and business aspects, and the sales and marketing requirements, were always accounted for. He worked out effective strategies and executed them. He branded himself by making his name synonymous with the term “inventor” to the exclusion of others so effectively that today, a hundred years later, this connection remains embedded in concrete.

His work ethic is legendary, but one should remember he almost always had several people helping him in the work. When it was likely to take numerous, sometimes thousands of

attempts to get to a satisfactory result on one of his objectives, he would employ an efficient assembly line approach to the task. While working for Edison, Nikola Tesla once described Edison's lab methodology as an “empirical dragnet.” The perspiration was not only Edison's to sweat; rather he shared his release among a number of dedicated workers.

Henry Ford's Perspective on Edison

Legendary car maker Henry Ford knew Edison well from having been an employee for a while, then a close friend for many years afterward. Ford had a unique personal perspective on Edison's broad mindedness, marketing, business and inventive genius, technical expertise and lack of inventoritis. Ford was working as an engineer in one of Edison's early electricity generating stations and knew much about him and his abilities before they had first met.

Ford confirmed this at their first meeting that took place at the 1896 annual convention of the Edison central station executives where they were surrounded by electrical people who were firmly of the opinion that automobiles would be electric. Ford discussed his approach to the automobile powered by a gas engine and was profoundly impacted by Edison's response.

The following story in Ford's words was taken from his 'Edison As I Know Him' book[25] that was published in 1930 while Ford was at the top of his game and his company was at its peak. Ford was selling millions of cars per year with over half the global automotive market share. He had recently completed construction of his manufacturing crown jewel, the massive River Rouge plant, after a decade of construction. In Henry Ford's words:

> Our first actual meeting was at a dinner at the old Manhattan Beach Hotel at Manhattan Beach, which is just a few miles from Coney Island. We were holding an Edison Convention, an annual event to which came the chief engineers and managers of the various

25. Ford, H. & Crowther, S. (1930). Edison as I know him. New York: Cosmopolitan Book Corporation. (pp. 1-7).

Edison plants in order to exchange experiences. I went with Mr. Alexander Dow, the president of the Detroit Edison Company. The dinner table was oval, with Mr. Edison at the head. At his right sat Charles Edgar, president of the Boston Edison Company, and I sat next to him. On the other side of the table were Samuel Insull, who has since become great in the electrical industry; J. W. Lieb, Jr., president of the New York Edison Company; John Van Vleeck, the chief engineer of the New York Company; John L. Beggs, and a number of others of whom my recollection is not so certain.

During the afternoon session, the convention had given itself up largely to discussing the new field that was opening for electricity in the charging of storage batteries for vehicles. The central station men saw in the electric carriage, the horseless carriage that everyone had been looking for.

They predicted that the cabs and carriages would soon be on the streets by the thousands and would require much attention in the way of recharged batteries and the like, and of course that meant enormous revenues. At dinner the talk continued until Alexander Dow, pointing across the table to me, said: “There's a young fellow who has made a gas car.” Then he went on to tell how he had heard something going pop, pop, pop below his office window and had looked out and seen a small carriage without any horses, and my wife and little boy sitting in it; that then I came out of the plant, got into the seat, and the thing moved off- pop, pop, popping all the way while everyone stopped to look. Someone at the table asked me how I had made my carriage go, and I started to tell, speaking fairly loudly so that those across the table could hear me, for they all stopped talking to listen.

Mr. Edison caught some of it and put his hand to his ear to hear better, for even then he was decidedly deaf. Mr. Lieb saw Mr. Edison trying to hear and motioned to me to pull up a chair from another table and sit beside Mr. Edison and speak up so that all of them could hear. I got up, but just then Mr. Edgar offered to change places with me, putting me next to Mr. Edison. He began to ask me questions which showed that he had already made a study of the gas engine. “Is it a four-cycle engine?” he asked. I told him that it was, and he nodded approval. Then he wanted to know if I exploded the gas in the cylinder by electricity and whether I did it by a contact or by a spark, for that was before spark plugs had been invented. I told him that it was a make-and-break contact that

was bumped apart by the piston, and I drew a diagram for him of the whole contact arrangement which I had on my first car, the one that Mr. Dow had seen. But I said that on the second car, on which I was then working, I had made what we today would call a spark plug, it was really an insulating plug with a make and break mechanism using washers of mica. I drew that too. He said that a spark would give a much surer ignition and a contact. He asked me no end of details and I sketched everything for him, for I have always found that I could convey an idea quicker by sketching than by just describing it.

When I had finished, he brought his fist down on the table with a bang and said: “Young man, that's the thing; you have it. Keep at it. Electric cars must keep near to power stations. The storage battery is too heavy. Steam cars won't do either, for they have to have a boiler and fire. Your car is self-contained (carries its own power plant) no fire, no boiler, no smoke and no steam. You have the thing. Keep at it.”

That bang on the table was worth worlds to me. No man up to then had given me any encouragement. I had hoped that I was headed right, sometimes I knew that I was, sometimes I only wondered if I was, but here all at once and out of a clear sky the greatest inventive genius in the world had given me a complete approval. The man who knew most about electricity in the world had said that for the purpose my gas motor was better than any electric motor could be. It could go long distances, he said, and there would be stations to supply the cars with hydrocarbon. That was the first time I ever heard this term for liquid fuel. And this at a time when all the electrical engineers took it as an established fact that there could be nothing new and worthwhile that did not run by electricity! It was to be the universal power. Of course their expectation could not be fully realized because electricity is not a prime mover.

It was wholly characteristic of Mr. Edison to have the broader vision and to know that, while the uses of electrical power could be extended almost indefinitely in some directions, there were others in which it could be at the best only a makeshift. Not the least among the many remarkable qualities of the Edison mind is its ability constantly to maintain a perspective. He never has any blind enthusiasms. An inventor frequently wastes his time and his money trying to extend his invention to uses for which it is not at all suitable. Edison has never done this. He rides no hobbies. He

> views each problem that comes up as a thing of itself, to be solved in exactly the right way. His approach is no more that of an electrician than that of a chemist. His knowledge is so nearly universal that he cannot be classed as an electrician or a chemist. In fact, Mr. Edison cannot be classified. He knows instinctively what things can be used for and what they cannot be used for.

The last sentence regarding Edison knowing "instinctively what things can be used for…" should be interpreted in the widest possible context since Edison was already famous, highly experienced and a broad thinker by 1896, as was Ford at the time of his much later recollection. Edison viewed the problem from his highly developed market-savvy perspective. When he pounded his fist on the table and gave Ford his considered opinion, he did so with the full weight of his tremendous accrued knowledge and experience. This was a defining moment in automotive history. Ford certainly viewed it that way more than 30 years later.

Ford was crystal clear on Edison's qualities as an outstanding leader. In the same book[26], he wrote:

> He is the leader and no one ever questions his leadership. I believe it is rarely possible for any assistant to get ahead of him on a suggestion - not because he is unwilling to receive suggestions but because in his comments on any experiment he invariably covers the point of the subject so thoroughly that the assistant discovers that his suggestion was only a tiny section of what Mr. Edison already had in mind. He does not have to assert leadership. It is simply unquestioned by any man of real intelligence - and Edison does not for long have near him any person who does not possess far more than average intelligence. He will not tolerate stupidity or long-winded explanations.

Edison's original Menlo Park laboratory facility has been preserved by Henry Ford at the historical Greenfield Village site in Dearborn, Michigan. It is within a 15-minute drive from either Ford Motor Company's world headquarters or the recently revitalized River Rouge

26. Ford, H. & Crowther, S. (1930). Edison as I know him. New York: Cosmopolitan Book Corporation. (pp. 65-66).

Plant where the popular F150 series trucks are currently in production. The reconstituted Menlo Park is also within easy walking distance of the company's main global R&D campus which it is located adjacent to.

Ford had the original chair Edison sat in nailed to the floor in front of the last place he used it, his workstation. Menlo Park and the “inventor's” chair are still in place today, open to the public for tours. The chair is fixed in front of a table containing a series of the most advanced batteries of the day. Ford relocated Menlo Park to preserve this important part of the Edison historical record in a very tangible way. He believed the Edison example to be of great importance and historical significance. He appears to have gotten it right.

Unfortunately, the Ford Motor Company is currently in serious financial trouble and might collapse or become absorbed within the next few years. The company took $12.7 billion in losses and sales declined to $160 billion in 2006, down from $177 billion in sales with a small profit the previous year. These are the highest losses recorded in the company's 103-year history. Inventoritis has been part of the problem. The Ford executives and R&D people should revisit the preserved Menlo Park that is located in their midst. Chapter 4 looks into the current inventoritis issues at the company.

Edison's Ten Point Method of Marketing

Edison used process to market products effectively. Throughout his long and productive life, he was able to maintain perspective and not lose touch with the market. His methods, applied over a long period of time, helped him to usher in the age of electricity. Ten essential elements of his method of marketing form what we refer to as the Edison Ten Point Method of Marketing. He had things going so well over his lifetime that he became branded: the world's most famous inventor, a moniker which remains ever so strong even today. There has never been a more effective product marketer than Thomas Edison.

The Edison Ten Point Method of Marketing:

1. He knew the customer.
2. He was an excellent networker and understood networking theory (a diverse network he could influence or ask for feedback).
3. He understood that execution is everything (he ran projects the same whether they had a patent or not).
4. He was extremely teachable and had a strong commitment to self-improvement.
5. He invented or improved upon many marketing concepts and techniques.
6. He had a world-class set of advisors who were not afraid to exercise candor. (Henry Ford, Harvey Firestone, etc.).
7. He knew how to manage his brand effectively (public relations, media photos, media kits, the use of “show rooms” etc.).
8. He knew how to attract world-class talent (employed Tesla).
9. He controlled credible channels (distribution and media).
10. He knew how to price products and opportunities effectively.

To successfully employ the Edison Method of Marketing, one must be free of inventoritis and have sufficient leadership capabilities. Notice that having a ton of money is not part of the method. Edison was not born independently wealthy. By applying sound processes, he was able to attract whatever financial resources he needed to carry out his aims.

The Tesla Death Ray Method of Marketing

A striking feature of many people of extraordinary talent or brilliance is that though their focus may remain great in one area, it often leaves them vulnerable to deficiencies in other areas. Nikola Tesla embodied this to the extreme. Known for his technical brilliance, he was not a balanced person and was unable to maintain a balanced perspective.

Tesla was anti-business, anti-establishment, asocial and had no marketing process. Tesla did not appear to match well with any of the points on the Edison Ten Point Method of Marketing.

Arguments have been made that because Edison was ahead of Tesla by about 15 years in building his reputation and a very strong position, Tesla was at a serious disadvantage. This argument is a poor one in light of the contrasting example of Henry Ford. Ford also started out as an Edison employee. He applied much of what he had learned from Edison and developed a business based on gasoline-powered engine automotive technology, competing directly with Edison's electric automobile technology. Ford built his business into one of the world's greatest companies without burning his bridge to Edison.

Tesla could have likewise developed a productive mutually-beneficial relationship with Edison rather than continually attack the man and his works, inadvertently destroying himself in the process. As an alternative, Tesla could have played a strong second, much like in the car rental business where Avis actively markets being the #2 car rental company while Hertz has been the market leader. Avis has been running its current “We Try Harder” advertising campaign for over 40 years quite successfully.

Tesla had severe inventoritis and serves well as a model for this condition. He did a variety of things to destroy his chances of success. In Tesla's attempts to invent and market doomsday devices and death rays, he became widely viewed as a mad scientist. He effectively turned these weapons on himself, at least from a marketing perspective. The elements of his dreadful inventoritis condition form our Tesla Death Ray Method of Marketing. Anyone interested in effectively marketing an idea, invention or product and building wealth should carefully avoid Tesla's death ray.

Tesla's problems stemmed from two main areas:

1. **Tesla had no formal marketing process.** Unlike Edison who had developed the process outlined in the previous section, Tesla had none. He did not properly evaluate or consider the commercial viability of his ideas and inventions. He alienated the media by drawing their attention to outlandish ideas and schemes instead of using every available opportunity to promote

marketable products. There was no apparent strategy and it did not appear that Tesla put his commercial goals first. Nor did he seem to understand branding, unlike Edison who was always developing his brands for light bulbs, phonographs, and various other products and inventions.

2. **Tesla was not an effective leader.** He did not have a solid team and did not empower or invest in others. Instead, Tesla seemed to care more about himself than the market or customer. He was also dishonest in his dealings with others to whom he was accountable - like J. P. Morgan. Furthermore, Tesla aggressively attacked Edison with no clear objective or post-war strategy.

Some argue that Tesla was a man ahead of his time. Tesla himself made this claim on occasion. It simply isn't true. Tesla's marketable ideas were either exploited in his day or could have been at the time. His motors and AC electrical system certainly were, and he did very well by it. He could have similarly exploited his radio and fluorescent lighting inventions but instead went off on weird tangents. These important technologies were developed by others while he lived.

The problems Tesla encountered are as applicable to companies and organizations as they are to individual inventors. Poor leadership and unsound processes within companies or organizations often lead to resources being applied to innovations that become wasted.

Commercial Success Rates: Edison vs. Tesla

There is quite a large body of knowledge contained in the lifetime accumulation of patents granted to Thomas Edison and Nikola Tesla. One can learn a great deal about what was going on technologically at that time as the world entered the age of electricity. Equally interesting is the knowledge than can be gained from a review of their patents carried out with the objective of examining and quantifying which went commercial and also seeing which ones were duds.

Edison received 1,093 U.S. patents over a 64-year period from 1869 to 1933 beginning at age 22. Edison was filing patents until the day he died in 1931 at age 84, with a couple patents issued a year or two after his death. Edison's record for the lifetime number of patents issued to an individual still stands a century later. Appendix C is a complete list of Edison's U.S. patents.

Tesla received 112 U.S. patents over a shorter 42-year period beginning at age 30, as soon as he left Edison's employ in 1886. His last patent was granted in 1928, 15 years before he died in 1943 at age 87. While in Edison's employ from 1884 to 1886, like any of Edison's other employees, Tesla would have worked on Edison's inventions and not necessarily have been named as a co-inventor on any of those patents. Appendix D is a complete list of Tesla's U.S. patents.

A review of the patent lists for each of Edison and Tesla shows the areas they were working in at various times. It also reveals how each of them had multiple patents in various areas. For example, Edison had over a hundred patents in each of the telegraphy, electric light, phonographs and power generation areas. Likewise, Tesla had most of his patents in the areas of power generation, electric motors, high voltage and frequency AC, and radio/wireless power. The data for the two respective lists came from the United States Patent and Trademark Office[27], except for the last two columns that were prepared by the authors while reviewing the numerous patents.

Each of the patents listed chronologically in the appendices carry an indication as to whether or not they had any “commercial relevance.” They were also each identified with an “application category” such as telegraphy, power generation, electric lighting, telephony, electric motors, engines, instrumentation, cement making or power distribution.

For the patent lists, “commercial relevance” is not the same thing as “commercial success.” It would be too arduous a task to go through the historical financial records relating to each of the several hundred patents to determine if they were each individually profitable. It is especially difficult with there being complex licensing arrangements and multiple companies involved over different time periods.

27. United States Patent and Trademark Office: Washington DC. www.uspto.gov

Additionally, for the many patents relating to improvements, manufacturing processes and materials, it is impossible to break them apart to quantify the commercial value of each one. Many of the required records are not available.

Commercial relevance was determined mainly by whether or not the invention was put to commercial use. For the vast majority of the patents which were for improvements in one of the application areas such as electric lights or power generation, if the patents were tied to an area such as these that were generally commercial areas, the patent would usually be counted as commercially relevant. This was done except where the patent was one for something that did not have a use within a commercial application area or never did get sold, licensed or put into commercial production. Patents for both Edison and Tesla that did not have commercial relevance included those for pyromagnetics, flying machines and some types of power generation.

Other examples in the case of Edison included his first patent that was for a vote recording machine, and later patents for vocal engines and vacuum fruit preservers. Edison's numerous patents in mineral processing were commercially relevant because, although he lost money in the iron ore aspect, these were large commercial operations and the technologies had additional commercial applications such as for cement making in which he also had a stake.

In his later years, Tesla had obtained patents in a number of new areas that never became commercially relevant. These include patents for wireless power distribution, check valves, perpetual free energy, pumps, turbines, ice insulation and fountains.

There is also considerable debate as to whether or not Tesla's nine patents shown in the “radio/wireless power” application category were commercially relevant. For this analysis, they are not counted as commercially relevant because Tesla never derived any commercial products from them. J.P. Morgan paid Tesla a considerable amount of money from about 1901 to 1904 to deliver radio, which Tesla never did. In the meantime, Guglielmo Marconi developed the radio industry, building up American Marconi that later became part of the Radio Corporation of America (RCA), owned mainly by General Electric. The

U.S. Supreme Court eventually credited Tesla over Marconi with the invention of radio, a few months after Tesla died and six years after Marconi died.

But that does not overcome the fact that Tesla never developed commercial products or business in the radio field from his 1900s patents. Tesla also did some engineering work for RCA after Marconi died. He was kept under strict control while at RCA and did not do any patenting there. The whole radio affair was a messy one for Tesla.

The commercialization numbers for Edison are very impressive. He only had 10 duds out of his 1,093 patents for an overall lifetime failure rate of 1% (10/1,093**=>**0.9%). His failure rate decreased as he became older and more experienced. He only had one dud out of 400 in his last 40 years for a ¼% (0.25%) failure rate during that long period. Edison's patents were like a steady stream of press releases, announcing successes in various areas.

This later failure was for a helicopter he patented in 1910. The detail on Edison's helicopter is that in 1880 he did build a rotor system and experiment with various blade designs, spinning them while measuring the forces, etc. He determined it needed a powerful engine with a certain power to weight ratio such as did not exist at the time to make it work. He was, of course, correct.

Edison did not patent it then. The 1910 patent (30 years later) was at the time that others were getting closer, so filing a patent was probably more of a hedge strategy than anything else. He was on the right track and if he wasn't so heavily involved in phonograph developments, battery technologies, and pioneering massive cement manufacturing and mineral processing industries at the time, he probably would have gone in deep enough to maybe come up with a suitable engine and the other technologies needed to make the helicopter work.

Tesla's commercialization success numbers were almost as impressive as Edison's while he was involved with Westinghouse from about 1888 to 1897, under George Westinghouse's leadership. Tesla obtained 85 patents prior to leaving Westinghouse to truly go out on his own in 1898 when he moved to Colorado Springs, Colorado for a year or so to do high voltage experiments. Of these 85 early patents, only 4 were duds, providing for a low 5% failure rate (4/85**=>**4.7%).

Of the remaining 27 patents Tesla obtained from 1900 onward when he was basically out on his own, only five were commercially relevant. His failure rate shot up to a staggering 80% (22/27**=>**81.4%). His five successful patents were for instrumentation products he developed over about a 10-year period for the Waltham Watch Company of Waltham, Massachusetts. Each of those five patents were issued as having been assigned to Waltham which means they were likely already assigned at the time of the initial patent application. This suggests Tesla was not really doing the work for his own account but was rather working for a patron. That counts as being commercially relevant because Waltham advertised and produced these products with Tesla having been paid for his work in the process. None of the other 27 patents were similarly assigned. Nor were they otherwise developed into commercial products or applications.

Some of Tesla's duds in those later years remain controversial. Various scientists and engineers have built and tested some of them, finding them deficient. For example, Tesla's 1920 patent titled “Valvular Conduit” for a check valve designed for use with various fluids, and some suggest high energy particle beams, simply does not work. His turbine and pump patents yield inefficient machines that have never gone into production. His two ice insulation patents seem ridiculous when one considers the prospects of insulating high power electrical conductors by freezing them in ice, especially in comparison to other types of insulation including those available in his day. His two “Radiant Energy” patents in the perpetual free energy application area amounted to little more than making solar panels by coating a metal sheet with a transparent insulator and hooking up capacitors to them to produce electricity. It doesn't work. Tesla never developed a business selling his patented lightning rods. Nor did he produce or sell his flying machines for which he took out two patents.

Last, but not the least impractical, is his patent for a new type of fountain. In the patent specification, Tesla criticizes the popular fountains of his day as being boring, inefficient and unimpressive. His design was for a non-artistic high-powered water fountain. Owning one would be like having a circular version of Niagara Falls in one's yard.

Beyond those covered in his patents, there are apparently some mysterious Tesla inventions for which there were and still are large ready markets, such as cars than run forever without carrying fuel. Unfortunately, none of these alleged products ever appeared on the market.

While Tesla was working for a highly market savvy Edison or Westinghouse, his creative abilities were effectively channeled into producing some of the greatest technological developments in history. He was working on inventions that were in tune with the market with predictable positive results from which he made enormous amounts of money. When on his own, his results became far less predictable and he got himself into all sorts of expensive difficulties. His innovation success rate plummeted.

Chapter 2 contains quantitative data that reveals Tesla's later 80% failure rate is approximately the same as that of the typical modern corporation. The numbers clearly suggest modern industry has adopted the Tesla approach to innovation rather than the extremely successful one employed by Edison with its less than 1% failure rate.

Appendix C

Complete List of Thomas Edison's 1,093 United States Patents

Check out all his patents at this url:

Actual: http://happyabout.info/OvercomingInventoritis-ThomasEdisonsPatents.pdf

Clickable: http://tinyurl.com/yqzhw3

Appendix

D Complete List of Nikola Tesla's 112 United States Patents

Check out all his patents at this url:

Actual: http://happyabout.info/OvercomingInventoritis-NikolaTeslaPatents.pdf

Clickable: http://tinyurl.com/2cxl2s

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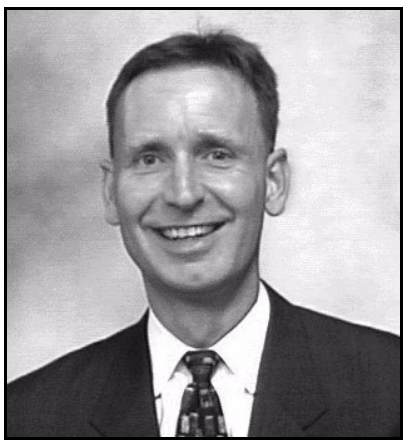

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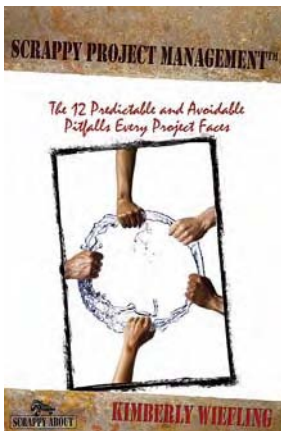

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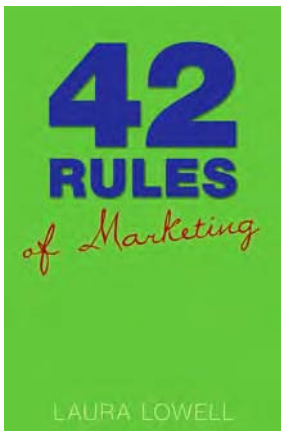

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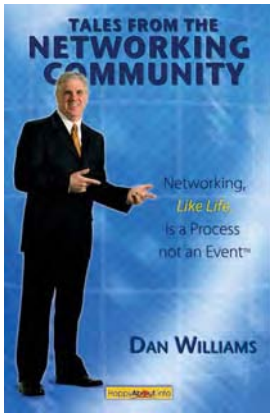

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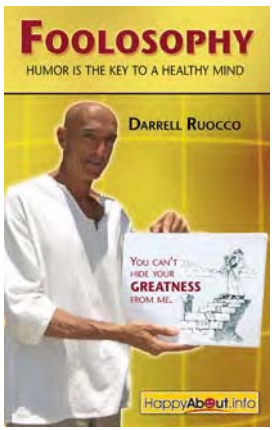

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