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A Path to Reclaim Industry Leadership for Dell

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A Path to Reclaim Industry Leadership for Dell

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Abstract

A Path to Reclaim Industry Leadership for Dell

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The high-tech industry is an extremely fast-paced and highly competitive one with constant changes and with companies entering and exiting the playing field in a matter of months. Within this ruthless environment Dell Inc. emerged as a singular player in January 1984 and rose to be the world's largest personal computer maker in just seventeen years in 2001. One has to ask what made Dell so special and how did Michael Dell make his fortune from his dormitory room at the University of Texas at Austin. Furthermore, what explains Dell's decline from its number one position in the world in 2001 to barely number three now as it stands behind Acer and clearly behind the current industry leader Hewlett-Packard?

This paper is an attempt to take the reader through the history of the rise and fall of Dell. More importantly, it seeks to identify the weaknesses as well as strengths, and advantages as well disadvantages of the business model of this company. Finally, the paper will outline the necessary steps that Dell must take to reclaim the crown of the largest and most successful computer manufacturer in the world.

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Introduction: *An Exceptional Path Traveled*

Michael Dell created a winning company 26 years ago, originally named PC's Limited, to be a low-cost maker and distributor of personal computers. The business was successful enough that he later renamed the company Dell Computer Corporation. In 2003, the company was renamed Dell Inc. as Dell ventured away from computers to be more diversified with the hope of raking in additional revenue and profit. And for the longest time, with its lean and efficient, build-to-order, and direct-selling business model, the company was the envy of many industries beyond its reach. Also for the longest time, Dell was the unquestioned leader of mass manufacturing of personal computers (PC) and servers. And for a long time to come, the Dell success story will be studied by business administration and management students around the world. But that was the "old" Dell before the computer market was saturated in the United States and the PC was commoditized. In order to understand the present condition of the company and make intelligent recommendations about the future, one needs to understand what made Dell formidable for so many years and what changed. In the following, I share my thoughts on what made the "old" Dell so competitive and efficient, what made it America's Most Admired Company in 2005[1].

LEAN AND EFFICIENT

The famous negative cash-conversion cycle[2] worked beautifully for Dell for so many years before the rest of the industry caught up to it. At the heart of Dell's success at the beginning was its highly sophisticated and efficient manufacturing and

[1] CNNMoney.com http://money.cnn.com/magazines/fortune/fortune_archive/2005/03/07/8253449/index.htm (Lustgarten 2005)

[2] About.com Guide http://beginnersinvest.about.com/od/beginnerscorner/a/aa112506a.htm (Kennon 2001)

procurement operations. Dell's competitors were building to stuff the retail channels in hope of selling through. But large inventories mean slow response to changing demand. In addition, while products wait in large back warehouses and storefront shelves to be sold, competitors have a stagnant cash flow for months at a time. Worst yet, competitors have to pay the "middle-man", the retail channels, a portion of their hard-earned profits.

Thus while competitors struggled with high inventory, slow response to changing market needs, and fast-paced technological changes, the way for Dell was much quicker[3]. The right way was to have part suppliers' semi-trucks back-up to Dell's manufacturing floors, loaded only with parts that would be consumed directly by a waiting-to-be-built order that had arrived straight from the customer. Only goods that were loaded to the floor belonged to Dell, the rest still belonged to the suppliers. They were free to undock and take the leftovers home at their own cost[4]. Dell would be billed and would pay suppliers promptly 33 days after the parts have been consumed[5]. On the other hand, every single online order from customers was charged immediately with full refund capability. It was a completely legitimate and a very simple method of operation. Lean and efficient!

BUILD-TO-ORDER

Many companies loudly claim that they can do build-to-order. But for Dell, build-to-order is a core competence. Competitors would offer a limited number of configurable computer options, say 500 to be liberal, and then announce to the world that they can build to order. For Dell, this is merely a fraction of the almost unlimited

[3] Ecommerce Times http://www.ecommercetimes.com/story/18779.html?wlc=1304092394 (Hirsh 2002)
[4] CNET News http://news.cnet.com/Inside-Dells-manufacturing-mecca/2100-1003_3-5428990.html (Kanellos 2004)
[5] FrankVoisin.com http://www.frankvoisin.com/2011/04/04/dells-cash-conversion-cycle-provides-a-competitive-advantage-dell-hpq/ (Voisin 2011)

configurable possibilities, say 15 million to be conservative. That is the true build-to-order model that Dell had invested so much money and manpower in to design and maintain. To put it in layman's term, there is a single unique configuration possible for almost every single individual who wishes to buy a Dell machine! In addition, Dell blew away its competition[6] by shipping directly to customers from its 9 manufacturing facilities located in 7 countries including the U.S. Customers and competitors alike would marvel at Dell's build-to-order manufacturing capabilities[7].

DIRECT-SELLING BUSINESS MODEL

One Dell advantage that competitors try relentlessly to counteract is the direct-selling model. By cutting out the middle man, as in retail stores and/or resellers of products and services, Dell was able to reduce marketing costs significantly. Instead of pocketing the profits, Dell transferred the savings directly to customers. This put Dell's competitors in a corner with unappetizing choices: Either reduce prices to remain competitive (in effect reducing their margins and profits) or risk losing customers. Customers clearly saw the advantages in price for performance with Dell; they flocked to the web and phone for better machines with less money. In addition, Dell could retain invaluable customer data to tailor products and services to specific customer needs. This was something competitors long for but could not afford to obtain easily. Another major advantage was the just-in-time (JIT) manufacturing approach[8]. Dell would not build a computer until there is an order waiting in the queue; thus inventory is virtually eliminated. This was particularly critical since computer components were known to

[6] Ecommerce Times http://www.ecommercetimes.com/story/18779.html?wlc=1304092394 (Hirsh 2002)
[7] CNET News http://news.cnet.com/Inside-Dells-manufacturing-mecca/2100-1003_3-5428990.html (Kanellos 2004)
[8] ComputerWorld http://www.computerworld.com/s/article/54131/Just_in_Time_Manufacturing (Songini 2000)

change rapidly with the number of transistors that can be placed on a circuit board doubling every two years[9] as they reach saturation point. Instead of holding components in inventory, Dell was able to adjust end-product prices based on market movements quickly and effectively while competitors were still looking around dealing with big inventory overload. The direct-selling business model works!

[9] Moore's Law from Wikipedia http://en.wikipedia.org/wiki/Moore's_law (Wikipedia 2011)

Analysis: *The Turning Point*

Among the top five PC vendors in the world, Dell's major competitors include Hewlett-Packard, IBM, Fujitsu/Fujitsu Siemens, and Toshiba. Companies like Apple, Sony, Lenovo, and Acer were not even in the top five at the time in 2003 (Table 1).

Company	2003 Shipments	2003 Market Share (%)	2002 Shipments	2002 Market Share (%)	Growth (%)
Dell	25,302	15.0	20,110	13.2	25.8
Hewlett-Packard	24,230	14.3	21,567	14.2	12.3
IBM	8,608	5.1	7,913	5.2	8.8
Fujitsu/Fujitsu Siemens	6,370	3.8	5,714	3.8	11.5
Toshiba	4,944	2.9	4,233	2.8	16.8
Others	99,402	58.9	92,758	60.9	7.2
Total	**168,856**	**100.0**	**152,295**	**100.0**	**10.9**

Table 1: Preliminary Worldwide PC Vendor Unit Shipment Estimates for 2003 (Thousands of Units) (Pettey, Gartner Inc. 2004)

Note: Data includes desk-based PCs, mobile PCs and IA-32 servers.
Source: Gartner Dataquest (January 2004)

Ever since the fourth quarter of 2003, after Dell dethroned the combined Hewlett-Packard (HP) + Compaq Computer, Dell achieved the title of the number one PC vendor in the world. Until the second quarter of 2006, Dell continued to maintain a healthy market share between 18% and 19% worldwide[10] or 17.7% according to Gartner (Table 2), the second in command, HP held roughly 15% or 14.8% (Table 2) in the same period. Dell was unbeatable during this era even though it did not seem to try hard to keep the

[10] Wikipedia.org http://en.wikipedia.org/wiki/Dell (Wikipedia, the free encyclopedia 2011)

number one position. And to many analysts, Dell was matchless due to its minimal inventory, direct-selling business model, and world-class supply chain portfolio.

Company	2Q06 Shipments	2Q06 Market Share (%)	2Q05 Shipments	2Q05 Market Share (%)	2Q06-2Q05 Growth (%)
Dell	9,730	17.7	8,717	17.6	11.6
HP	8,107	14.8	7,126	14.4	13.8
Lenovo	3,994	7.3	3,518	7.1	13.5
Acer	2,836	5.2	2,105	4.3	34.7
Toshiba	1,906	3.5	1,496	3.0	27.4
Others	28,338	51.6	26,520	53.6	6.9
Total	**54,911**	**100.00**	**49,482**	**100.0**	**11.0**

Table 2: Preliminary Worldwide PC Vendor Unit Shipment Estimates for 2Q06 (Thousands of Units) (Pettey, Gartner, Inc. 2006)

Note: Data includes desk-based PCs, mobile PCs and X86 servers.
Source: Gartner Dataquest (July 2006)

However, only a single quarter later, in the third quarter of the same year, Dell lost its lead in the PC-business to HP as estimated by both Gartner and IDC. During the same period, Dell's 3.6% growth paled in comparison to HP's 15.4% increase. This change put Dell at number two with 16.1% market share versus HP with 16.3% worldwide (Table 3).

Company	3Q06 Shipments	3Q06 Market Share (%)	3Q05 Shipments	3Q05 Market Share (%)	3Q06-3Q05 Growth (%)
HP	9,652	16.3	8,361	15.1	15.4
Dell Inc.	9,541	16.1	9,210	16.6	3.6
Lenovo	4,444	7.5	4,035	7.3	10.1
Acer	3,468	5.9	2,600	4.7	33.4
Toshiba	2,551	4.3	1,955	3.5	30.5
Others	29,486	49.9	29,256	52.8	0.8
Total	**59,143**	**100.0**	**55,417**	**100.0**	**6.7**

Table 3: Preliminary Worldwide PC Vendor Unit Shipment Estimates for 3Q06 (Thousands of Units) (Pettey, Gartner Inc. 2006)

Note: Data includes desk-based PCs, mobile PCs and X86 servers. Workstation shipments are not included.
Source: Gartner Dataquest (October 2006)

The problem only got worse when Gartner estimated that Dell's PC shipment declined 8.9% versus HP's growth of 23.9% in the fourth quarter of 2006. This resulted in a significant shrinkage in Dell's global market share to 13.9% while HP jumped to 17.4%. One may ask why and how did this happen? There have been many attempts by experienced market analysts and well-known scholars to answer this very question. Some answers are dead on, some are not so accurate. Below is my analysis of what went wrong at Dell, the winning company.

NOT UNDERSTANDING THE CUSTOMERS

Dell's direct business continued to thrive and the web-customers continue to grow with it; however, the web-based customers were only a portion of all desirable customers. Throughout the eighties and early nineties, computers were for the tech-savvy population only; either students or affluent business people would use PCs since they were too expensive and too complicated for a typical family. Moreover, PCs then required certain level of technical understanding and knowledge to operate. Only the technical customers would know how to use the Internet and would understand and appreciate the customizations that Dell offered. It was natural for them to go to the Internet and start configuring a perfect system for their needs. As a matter of fact, some people may even take pride in their ability to understand the many different components of a computer and to be able to order them "online". Online was indeed a fashionable word in the early days of the Internet. By focusing on the direct-only business, Dell understood and tailored their online store to this customer base and their tastes. It was perfect, and the business was booming for years. However, the rich customer-information at hand was not leveraged to understand more about emerging customer needs and desires. Little to

no data analysis was done on the direct customer data set to understand market trends and reposition the company to keep winning.

A CHANGING MARKETPLACE

As the PC became more popular, more and more people begin to find the necessity of owing one; customer tastes and desires changed with it. That signaled the beginning of the PC market being commoditized[11] but Dell was still heading down the path of true customization. Unfortunately, the population of online tech-savvy buyers grew very slowly as compared to the segment of new PC-users, which was experiencing a population explosion. The average buyers want to touch and feel their computers just as they want to look and feel the television they may hand-pick at an electronic store. Dell was missing out on this exponential growth of buyers. It was all-of-a-sudden no longer "cool" to understand and be able to buy computers on the web. People began to feel the burden of having to pick and choose between different processor speeds, memory sizes, hard disk drive capacities, operating systems, and software applications. An average buyer no longer needs a tech-savvy consultant to help them understand the different various components of a computer to buy one. They simply needed a computer that potentially suits their needs: A media center, email editor, Internet surfing, or picture editing machine is enough.

During the same period, Dell was still building factories with state-of-the-art technologies to handle the most complex configure-to-order (CTO) transactions[12]. The cost of maintenance was very high and thus cost-per-box was eating into already razor

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[11] Chief Executive.net http://www.chiefexecutive.net/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=8F3A7027421841978F18BE895F87F791&tier=4&id=CAAC069E693046BB88336BAA986A807E (Goings n.d.)

[12] CNET News http://news.cnet.com/Inside-Dells-manufacturing-mecca/2100-1003_3-5428990.html (Kanellos 2004)

thin margins due to price wars being waged constantly. Competitors such as HP had already outsourced most of their manufacturing at this time. HP's build-to-stock (BTS) model was gaining ground due to component prices holding steady since they reached the point of market saturation; thus Dell's biggest advantage of transferring reduced component costs directly to customers was no longer the winning recipe.

CONTINUATION OF A WINNING RECIPE

Why change when you already have a winning recipe? Just keep doing the same. However, for forward-thinking corporations, a more complex analysis was needed to answer a seemingly simple question. It was not done. Build-to-order with virtually

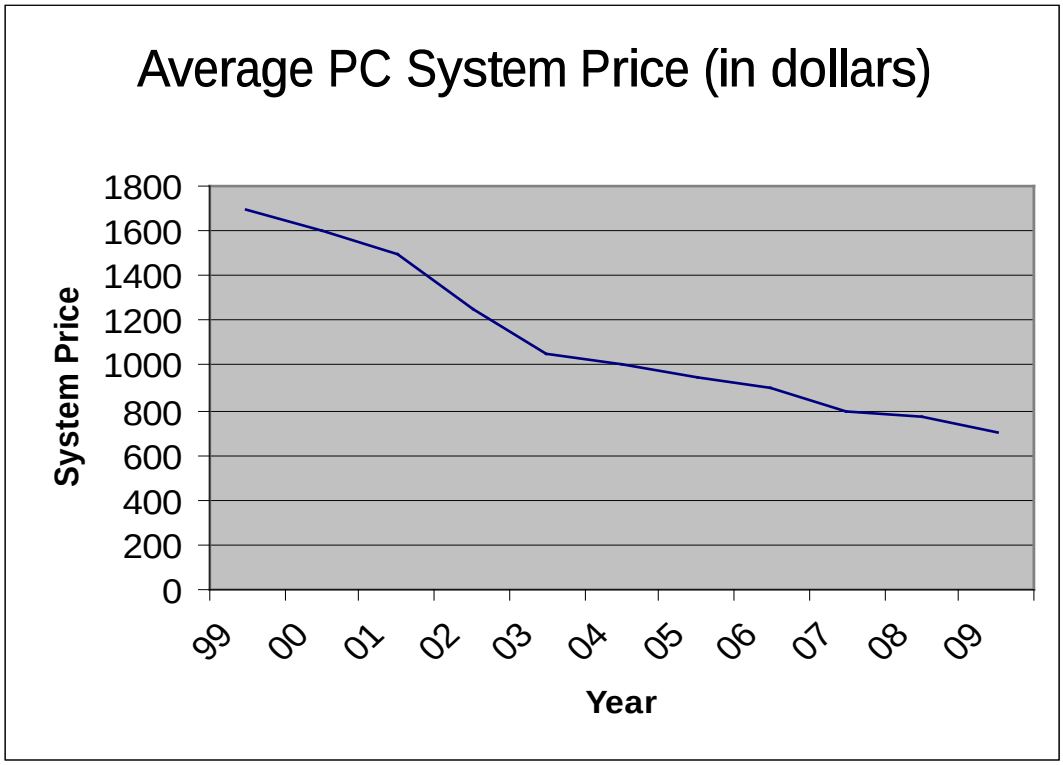

Figure 1: Average PC price from 1999-2009

unlimited customizations was the winning recipe. Therefore, Dell continued to go down

the path of true customization while customers, especially the fast-growing consumer segment, began to look for simple turn-key choices and businesses began to look for holistic datacenter solutions. Consumers don't want to deal with the complexities of CPU speeds, memory sizes, and hard disk drive capacities; they simply want a media center, an email or Internet computer, a picture-editing machine, etc. A critical change was needed but nothing was done to address the drastically changing environment. Another winning recipe was direct-selling through the Internet and phone orders. Dell continued to push hard along this path; it claimed that the direct relationship with customers is the best a company can have; arguably true, if that relationship, thus the information collected, is leveraged in some ways. As the PC became a commodity with PC prices falling below a thousand dollar for the first time in 2005 (Figure 1)[13], the fastest growing segment of the customer base was the "hands-on" type. These customers want to be able to go to a store to look and feel their new computer. They want to be able to pick up one right there and then to bring home and use immediately. Dell was not there!

THE DIRE SITUATION

Dell's stock has gone negative -162% since 2005 with its peak of $41.29 on July 22nd 2005 to a closing price of $15.57 on April 6th 2010[14] (Figure 2). The decline started when Dell missed its earnings in the second quarter of 2005 and propelled aggressively downhill with the lost in market leadership to HP back in the third quarter of 2006. Ever

[13] University of Notre Dame: Student International Business Council
www.nd.edu/~sibc/about/documents/PrintCopy.ppt
[14] Google Finance
http://www.google.com/finance?chdnp=1&chdd=1&chds=1&chdv=1&chvs=maximized&chdeh=0&chfdeh=0&chdet=1270587563357&chddm=492269&chls=IntervalBasedLine&q=NASDAQ:DELL&ntsp=0

since then, it has been on a depressing trajectory with inconsistent quarterly revenue and profit performances.

The company ended the year 2009, in third place with merely 12.2% market share, behind both HP at 19.3% and Acer at 13.0%. During the same year, HP grew by 11.3%, Acer jumped 29.4%, while Dell declined by a 9.1% (Table 4). This is not the position that Dell has ever expected to be in.

Dell had repositioned itself to cope with the extremely competitive marketplace

Figure 2: Stock price as of 4/6/2010

and the greatest economic downturn, dubbed The Great Recession by many economists. Dell had departed from its direct-sales model to expand the business via retail channels, a *New York Times* article on May 25, 2007 reported. It started with a handful of Wal-Mart

stores in the US and has now expanded worldwide to over 10,000 stores and counting[15]. Dell also started segmenting its supply chain portfolio such that simpler consumer products would be handled by a cheaper supply chain. This allows the cost structure to be more balanced; simpler products cost less so build them in a cheaper factory, more complex ones require higher cost to manufacture so build them in a more complex factory. Dell also started to outsource manufacturing to overseas suppliers to cut cost[16]. Finally, Dell jumped full-fledged into the services space with the acquisition of Perot Systems to capture the market segment that Dell had never truly played in before[17]. These actions showed that Dell is heading in the right direction though much work is yet to be done.

Company	2009 Shipments	2009 Market Share (%)	2008 Shipments	2008 Market Share (%)	2009-2008 Growth (%)
HP	58,947.8	19.3	52,942.2	18.2	11.3
Acer	39,897.1	13.0	30,834.1	10.6	29.4
Dell Inc.	37,355.6	12.2	41,074.1	14.1	-9.1
Lenovo	24,723.8	8.1	21,791.3	7.5	13.5
Toshiba	15,495.4	5.1	13,498.8	4.6	14.8
Others	129,453.0	42.3	130,657.2	44.9	-0.9
Total	**305,872.6**	**100.0**	**290,797.6**	**100.0**	**5.2**

Table 4: Preliminary Worldwide PC Vendor Unit Shipment Estimates for 2009 (Thousands of Units) (Pettey, Gartner Inc. 2010)

Data includes desk-based PCs, mobile PCs and X86 servers.
Source: Gartner (January 2010)

[15]Casestudyinc.com http://www.casestudyinc.com/hp-dell-retail-channel-strategy
[16] Reuters US http://www.reuters.com/article/idUSWNAB968220080906 (Finkle 2008)
[17] ZDNet http://www.zdnet.com/blog/btl/dell-perot-systems-purchase-an-anchor-acquisition-more-deals-likely/24573 (Dignan 2009)

Conclusion: *The Recommendation*

There are numerous lessons that could be learned from the Dell story. Unfortunately, no single set of actions can guarantee the restoration of Dell to industry. To put things in perspective, there are many additional important factors such as the state of economy, industry trend and fashion, personnel capability, and so on, which could contribute to a company's success or failure. However, my opinion is that the three critical directions below should be the top priorities for Dell as it tries today to turn the company around and be a winning company once again in the IT industry.

SEGMENT THE SUPPLY CHAIN

The PC industry has commoditized, just as one would expect from any mature product. It is such an irony that Dell, arguably the biggest contributor in making this a reality, did not reposition itself in time in the face of PC commoditization. New consumers emerged to buy PC. The once-complex personal computer needs to be much simplified to appeal to this newly emerging customer segment for Dell – the consumer. This trend, in comparison to the server side, with many complicated configurations such as Redundant Array of Independent Disks (RAID), redundant power supply, and systems management, calls for a different manufacturing approach - the segmented supply chain strategy. Segmented supply chain with suitable cost structure should be used to differentiate between many separate value streams. This allows Dell to cut significant costs by aligning the right products to match the right supply chain channel.

It is much simpler to build desktops and notebooks than servers. Therefore, a simple manufacturing facility should be used to build desktops and notebooks while allowing more complex servers and enterprise systems to be built in more sophisticated factories. This will allow Dell to have appropriate cost structures for different lines of

businesses. Only thus it can stay competitive and meet differentiated customers' expectations.

Configure-to-Order

There is a whole set of specialized customers like gamers and graphic designers who require much higher computing power than the average home-computer user, and would value the ability to customize their system. They want the specific CPU speed, specific memory manufacturer, specific graphic card, and so on. This is the customer set who is willing to pay more for the ability to mix and match exactly what they are looking for. Dell should continue to maintain the infrastructure needed to serve this customer segment. This segment offers higher margins due to the complexity of the system, which translate into a higher price point for Dell. After all, customization has been the core strength of Dell and still is until this day. Dell should continue to market this ability as a major differentiator from competitors like HP and Acer. It is specially a strike against Apple[18], which normally only has a handful of preconfigured systems for customers to choose from.

Build-to-order

The masses of retailers like Wal-Mart or Target and electronic giants like Best Buy or Gnome are a different set of customers. These vendors know and understand their own customers and requirements; thus they, in turn, have different requirements for the original equipment manufacturer (OEM) like Dell. This is the strategy of selling to the channels and there should be a supply chain to serve these vendors. This could be the segment where "off-the-shelf" designs and sub-contract manufacturing can be used since it is the lowest cost, quick, and most efficient in delivery. This set of customers may go

[18] MacWorld http://www.macworld.com/product/31260/apple_macbook_air16ghz.html (MacWorld n.d.)

buy a PC as they go buy a TV at Wal-Mart. Do not give them the sophistication that they do not desire; make it very simple for them.

Build-to-Stock

There is yet another set of little savvier buyers who are more technical than the build-to-order set of customers and who would want a few more choices. This customer set thinks they know what they want. I would compare their computer-shopping experience to buying a stereo system. It offers plug-and-play components but with a little more configure-to-order options. They also want the convenience of online shopping and delivery and not having to go to a store and haul things home. There should be a supply chain for these customers where a combination of "off-the-shelf" is used with some customization. Dell can build up limited inventory with specific high-selling configurations and have them ready to ship as soon as customers order them. This does create the complication of on-hand inventory management; however, it is worth the effort since a good customer experience is very valuable and it is only a small portion of the business.

Summary

Customers who do not value customization should not have to share the cost of highly specialized requirements from a specific set of customers just because the OEMs do not have the ability to design different supply chains for different customer segments. To design an efficient supply chain means that, at the high level, Dell would be able to serve different customer sets with different manufacturing capabilities, which allows for the appropriate cost structure to be in place. The customers who want high-end machines with specific customizations are willing to pay for these customizations will have a supply chain to accommodate their needs. Whereas typical consumers who think of PCs

like TVs or radios will not care about the CPU or the graphic card should have their own supply chain that support simplicity and the lower end cost structure. Finally, the big corporations, government, and enterprise-class customers should also have their own supply chain with higher quality, better tested, and higher reliability products. This customer segment also has a different cost structure since they are willing to pay for these services and it costs more to create and maintain such manufacturing environment. This segmentation of supply chain allows differentiation in cost per box and the cost of customization would be transferred to the appropriate customers who are willing to pay for them.

SIMPLIFY PRODUCT OFFERINGS

Dell needs to leverage the vast direct customer databases readily available internally to narrow down to what exactly the customer needs are and only offer the limited configurations that eighty percent of customers want to buy. The remaining twenty percent who wanted more customizations will be in the gaming or workstation segments, which will need to be served differently. Offer customers solutions, not complex unlimited configurable choices. If customers want media center, Internet or email computer, gaming machines, etc., offer them just that! So how can Dell get to a specific set of product offerings that customers want?

Market Research and Analysis

A lot of money spent on exploring customer requirements and market research goes by the wayside. Dell does not have to spend money on the data, just the mining of this data. Due to the history of the direct-sales model where no middle-man was involved, Dell has massive data about its customers that must be leveraged to understand and know more about customers and their spending ability and habits. There needs be an

organization that has the sole purpose of mining, studying, and analyzing customer behavior, needs, and wants. This organization, a single point of accountability in the company, is the voice of the customer that should be heard by everyone in the company. It also needs to work hand-in-hand with the marketing organization to craft up the customer requirement document for each product being planned and released. Furthermore, these two organizations need to work closely with the executive planning team to define the future product roadmaps for the company based on customer trends and movements in the market derived from the rich set of customer data. If this is accomplished, it would be one of the most closely held trade secrets that Dell owns since no competitor in the industry has the privilege of having such invaluable customer data.

User-based Industrial Design

Dell needs to focus on what customers want and how to predict what the fashion or trend will be so as to tailor its product offerings. The competitive edge is no longer about being the fastest to market or being the cheapest vendor, but about understanding customer's perception. This starts with the consumer, keeping in mind that it is the same people who will make major IT decisions for their companies. Put more focus on the consumer segment and Dell will have also captured, for the most part, the other segments of the industry including government, schools, and enterprise. There needs to be an organization whose sole purpose is to work with the customer requirement team (identified above) and to design the look and feel that meets customers' needs. A product that works and looks good has to be the main theme. The rest will follow.

The Right Number of Offerings

The product lines must not overlap; product differentiation is critical so as not to confuse customers on what they need to use for which purpose. At the same time, it is

critical to provide the right product mix. This means the customer analysis and the product marketing team must figure out the very few configurations that customers really want; the appropriate number so that the product can be designed, developed, manufactured, and sustained in the fastest, most cost-effective, and most simple way possible. There should be no tolerance for a "let's catch all" approach. Too many times, the marketing team will put forth unnecessary and unreasonable requirements to capture all possible customers. It is the result of lack of search and analysis on the customer and market requirements. This leads to several pitfalls and can only be seen after the product planning phase is complete.

Customer Impact

The first and most important aspect is the customer impact. With many configurations that overlap, a typical customer does not have the patience nor the technical background to choose the right system that fits his or her needs. This easily leads to a bad customer experience and worse yet, a returned system when it does not work as expected. This is cost prohibitive. Moreover, from the IT specialist perspective, it may take too long to decipher the complex brochure or the product offering catalog to figure out what is needed. The worst situation is when one would ask whether a competitor's product line is more streamlined for his or her business.

The Development Impact

Development and test will cost more since the product has to work with multiple components from multiple suppliers. The challenge is not all vendors' components will work the same way or will be designed according to standardized specifications. Extra effort with more manpower and development time will be needed to ensure compatibility across vendors and across many components.

The test aspect is also horrendous to look at. Multiple components lead to exponential growth in configurations, to lengthy test plans and test cases, in order to cover all the necessary combinations. In addition, there may be interoperability issues where components may interfere and not work with each other. Even if everything else is held constant, there will be more problems and challenges just because there are that many numbers of peripherals that need to be tested.

The complexity created also means product quality would suffer. Testing is an endless activity especially when there are an overwhelming number of components that needs to be tested. At some point, the decision is made to ship while there may be untested configurations or combinations; and inevitably there would be quality issues in the field. With highly controlled number of limited peripherals, the Apple strategy, the product quality will increase simply because there is less number of things to test and qualify.

The Manufacturability Impact

Manufacturability of products will decrease drastically. Due to the sheer number of parts builders have to deal with, workmanship issues will increase. Worse yet, missing, wrong, and damage matrices will go up; in this case, usually the end-user will take the hit – result in bad customer experiences. In addition, manufacturing will have to deal with space, allocation, and scheduling of parts on the lines appropriately in order to build and ship the finished products. Just the management and scheduling of these parts is a costly operation that is high maintenance and constant supervision is required.

Supply and Demand Impact

The increase in number of supported components and configurations comes with the challenges of procuring and managing the supply and demand processes as well.

Besides all the logistical difficulties from negotiating for the best price to choosing a supplier or multiple suppliers, procurement will also have to manage the ups and downs of customer demands and seasonal changes. There will be naturally more inventories to deal with. All supplies must be depleted appropriately to keep costs down and with more parts to deal with, inventory management of excess and obsolescence becomes that much more difficult. The product end-of-life and transition management can be a daunting task.

Summary

By offering unlimited configurations as it does today, Dell is adding a great amount of unneeded complexity into the whole product development, testing, deployment, and sustaining ecosystem in the product lifecycle. The amount of almost unlimited configurations – 15 million for one platform – created an unmanageable amount of complexity in every phase of the product lifecycle including but not limited to product forecast, procurement, delivery, manufacturing, and sustaining services. Lessons in the industry show that fast-growing competitors are offering in the tens or hundreds, but nowhere near the millions. That's what Dell needs!

ELIMINATE SYSTEMIC COMPLEXITY

There is so much natural complexity built into any corporate system. In the information technology world in particular, the complexity can increase drastically if not managed carefully. A lot of what's inherent in the IT space is the "soft" part of the business. This is an area where highly convoluted terabytes of data is gathered but needs much analysis and mining to understand and to make sense of. For a company like Dell with millions of transactions per day, the amount of collected data can be easily overwhelm any system of data management let alone interpretations that need to be done

by human. Take for example, a personal computer with all the electronic physical parts from a single screw to bigger peripherals like hard disk drives and printers. Not accounting for all the software and applications that sits on top of it, the potential combinations of parts and plug-and-play components can be mind-boggling. In realistic terms, we are talking about millions and billions of combinations when all these are combined together.

Another aspect of this complexity is how one would manage the supply and demand curves of each of these components. There must be ways to effectively and accurately forecast the demands for each of the parts. In addition, supplier management also plays a role in the picture. The number of supplier for each part is as important as how much it would cost and whether the cost will be competitive from one supplier to the next. The number of optimal suppliers for each component will enable the right balance of cost and benefit. The outline below is the framework for how this complexity should be handled and managed throughout the corporation.

Product Release Cycle Management

Given the vast number of personnel and people who need to focus on product delivery and maintenance, there must be a way for everyone to effectively communicate product deliverables and important information to all stakeholders. A company-wide and single project management toolset must be implemented. From product inception to product end-of-life, there must be a single and unified tool to communicate and to hold all information regarding the product. This starts with the product's first deliverable and milestone to the very last. In addition, an approval routing mechanism is needed to alert stakeholders of their action items and deliverables. This online tool is a single portal that houses every single piece of information about the product and has every single

deliverable with start and end dates clearly identified for each owner traversing throughout the entire company.

This is not an easy thing to accomplish but with engineering rigor and discipline, it can be done. It requires support and complete alignment from the top management to the bottom. The management team has to consistently enforce the use of this portal as a launch pad for any information relating to the product. The portal will also house additional product information like lessons learned, issues, test plans, test cases, and the like. When the next product is being analyzed and formed, all relevant lessons learned and other pertinent information get transferred automatically to the next product so that mistakes and issues do not repeat themselves. The ecosystem is understood by every stakeholder and the product structure is maintained by this portal through every aspect of the product life cycle.

Components and Parts Management

There are thousands of parts and peripherals as part of a product. These need to be managed systematically and must link directly to the product portal and is part of the ecosystem. The parts complexity is multiplied when it comes to manufacturing. Aside from stocking parts on the lines and how to consume them in build cells, inventory of all the parts have to be controlled as well. The system will need to connect all the parts together to the product portfolio such that when a part reaches certain thresholds, a trigger is happened so that the procurement personnel will know to purchase additional parts. This is part of supply and demand management. Furthermore, the system needs to be able to keep track of all potential substitutions for each of the part; this is parts substitution management. Finally, restricted parts against certain systems will also need to be maintained since not all parts work with a particular product.

Supplier Management

There is a balance between how many suppliers are needed for a component or system and how much those suppliers should be played against one another for the lowest possible price. At some point, the suppliers can lose interest if they do not see a sense of loyalty and partnership. This can happen if too many suppliers are contracted for a component. Diversification is a fine strategy to use until this is reached. This is when suppliers would leave for another vendor as soon as they see the first opportunity to do so. In my experience, the right number is about three suppliers for any big enough components where immediate needs cannot be accommodated via over-the-counter suppliers. Three suppliers still maintain the right level of competitiveness while making sure that a sense of partnership and loyalty is still there. This is the right balance since the limited number allows companies to work together to reach a common goal of servicing customers and always maintaining enough supplies for any given product. However, if more than three are in the mix, suppliers may not feel obligated to deliver especially when the price they receive is lower than that from other OEMs. Furthermore, as soon as they find another buyer at a higher price, suppliers will jump ship to get more money. Better pricing will outweigh loosely built relationships due to an overwhelm number of suppliers.

Summary

The complexity of the product release cycle, components and parts, and suppliers are networked together with the product specification and all engineering and project management to make a complete ecosystem. This system must be unified in a single tool that is used as a product portal for every stakeholder. It is also to serve as a single-sourced master database of information for company-wide people who need to be cognizant of the milestones and other deliverables of the product platform. This is done

as an effective way to reduce inherent complexity that is built into the release of any product from software, hardware to consulting services.

CONCLUSION

In order for Dell to make a comeback and reclaim its industry leadership position, it must redesign its supply-chain structure, simplify product offering, and reduce system complexity. For supply-chain design, it has to tailor product complexity and treat each product line differently from the delivery and manufacturing perspectives. There are separate delivery model and contract manufacturing chain for each product line of business for each customer segment. In the product offering space, Dell must learn the needs and desires of each customer-base and provide only an appropriate limited number of configurations for each segment, specially the consumer space since the PC has commoditized. The product offering must be classified into solutions rather than generic specification with technical jargons that only IT technologists can understand. Finally, the product management must be controlled through a single toolset to reduce complexity. Everyone in the company has to use this product portal as a master project management entity and as the main communication vehicle for milestones and deliverables.

If Dell will adhere to this framework to run its many major divisions, Dell should be able to leverage its strengths to the full extend and regain its leadership position in the IT industry.

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