

# World Class Supply Chains in the Computer Industry

by

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# 1 Introduction

This research paper analyzes supply chains in the computer industry and determines trends, strategies, and best practices that companies have adopted over recent years due to a changing business environment. This environment entails new technologies, the entrance of new competitors, and other factors both within and beyond the control of the competing companies. Further, the research paper assesses the whole spectrum of supply chains, from procurement of computer components to sales to end consumers, but focuses on the computer OEMs. These OEMs deal with thousands of suppliers and components, and millions of customers in this increasingly shorter product lifecycle industry. The OEMs are mostly assemblers of computer components (e.g. Dell) rather than developers of technology. On the other hand, some of the OEMs (e.g. IBM) also develop some critical technology components in-house to differentiate themselves in the marketplace.

This research paper starts by discussing supply chains on an industry level. It starts with giving an overview of the present industry structure - its different segments, its competitive landscape and its drivers for future growth. Finally the paper describes the different supply chain structures in the computer industry at a broad level to set a context for analyzing different companies operating in this industry.

The next section covers how IBM and Dell position themselves in the industry, their business and competitive strategy, their different business units and their target customer

segments. The section also analyzes their performance based on revenues, net incomes, and employee levels etc.

Lastly the individual supply chains of these two world-class companies are described, which includes the supply-side, inside, and customer-side business processes, and the framework and structure of the supply chain. It ends by comparing the supply chains of IBM and Dell and concludes on the research findings.

## 1.1 Motivation

The motivation for the research paper stems from the Supply Chain 2020 initiative, one of the current research efforts by the Center for Transportation and Logistics at the Massachusetts Institute of Technology.

The premise of this initiative is that corporations generally have short-term plans for adapting their current supply chains to fit their needs, while few corporations, if any at all, are able to develop long-term plans, for the next fifteen years. There are two phases in the Supply Chain 2020 initiative. The first phase entails researching different industries and companies to identify and understand their supply chains and the best practices, strategies, and external forces that drive them. The second phase builds on this information by analyzing the data, hypothesizing on future best practices, strategies, and external forces, and then modeling and simulating the structures of supply chains in the year 2020.

This research paper is involved with the first phase of the Supply Chain 2020 initiative. The purpose is to determine the key aspects of supply chains in the computer industry so as to provide the relevant and necessary information for phase two of Supply Chain 2020.

## 1.2 Approach

This research paper looks at two levels of information, the industry and two specific supply chain of two world-class companies in the industry. The industry level analysis identifies the general characteristics of supply chains, the competitive landscape, and evolving trends. The case studies on IBM and Dell give examples of actual supply chains, and the operations and business processes needed to support them. Finally it ties the research together by illustrating how the strategies and operating models of the industry level analysis apply to the IBM and Dell case studies.

The relevant literature about the computer industry and interviews provide the industry data required for this research. The literature provides background information about the structure of supply chains in the industry, factors that influence supply chains, and strategies that the players in the industry have developed to remain competitive.

Several executives from IBM and Dell were interviewed as part of the research. The information collected during the interviews have been an invaluable resource for drafting this document.

## 2 Literature Review

According to the prediction of Gordon Moore in 1965, the technological advancement of the computer processor has followed an exponential trend since its inception. With higher computational power and shrinking size, computers are now being used for a variety of purposes. With higher processor speed computers became more capable for handling more complex tasks. Researchers and technologists used this opportunity to develop newer applications of computers in business, universities and research labs. A new breed of consumers, who used to be only computer hobbyists in the past, started using computers for a variety of daily work and entertainment. With the shrinking size of the computers along with the development of cost effective technologies, computers started becoming affordable to more and more people. All these increased the demand for computers and hence more and more companies entered this industry. All these companies were heavily R&D focused and contributed to the development of computers and their uses. The companies were vertically integrated with each having their own product development, component manufacturing, assembly, software development and sales functions in-house.

‘In the 1970s and the early 1980s the computer industry’s structure was decidedly vertical. The three largest companies, IBM, Digital Equipment Corporation (DEC) and Hewlett-Packard, were highly integrated, as were the second tier of computer makers, including Burroughs, Univac, NCR, Control Data and Honeywell, commonly referred as “the Bunch”. Companies tended to provide most of the key elements of their own

computer systems, from the operating system and applications software to the peripherals and electronic hardware, rather than sourcing of subsystem modules acquired from the third parties' [1]

Each of the companies competed on proprietary systems that they produced in-house. Use of such proprietary systems locked the customers, as they could not shift easily from one system to the other. For example, HP's computer peripherals would not work with an IBM mainframe and DEC software would not work on an HP computer. This created silos in the market where each of the players had their own long-term customer contracts. This situation was an obvious disadvantage to the customers as they had very little bargaining power once they decided on a hardware vendor.

A paradigm shift in the whole industry was about to happen to show 'all advantages are temporary' [2]. In the 1970s when Apple Computer introduced its first personal computer, IBM felt the heat to introduce its own PC. But because of lack of commitment in the PC business, IBM decided to outsource two of its major components – the processor and operating system to two budding companies, Intel and Microsoft. This very decision started the shifting of bargaining power of the whole industry from the computer assemblers to the component manufacturers, to the benefit of the final consumers, but to the loss of the shareholders of some of these vertically integrated companies. What spread the fire was IBM not having any exclusive contracts with any of these two supplier companies, who could own and sell their technology to anybody they would like. In their own interest, both Intel and Microsoft decided to make modular designs of their



products so that they can sell them to multiple vendors to maximize profits. This inception of modularization spread rapidly across the other component parts, and finally to the majority of product ranges.

Product modularization coupled with shifting of power upstream in the value chain gave birth to three distinct tiers in the industry - the hardware component manufacturers, the operating system and other software developers, and the computer assemblers (OEMs). This tierization gave rise to a different competitive landscape for the companies competing in each of these tiers. The hardware and software developers became the technology owners whose main competency was in research, development and innovation. The operating system and software developers started competing on killer applications. The computer assemblers became the owners of the customers and constantly strived to reduce cost and increase service levels to their customers. But it would be inappropriate to generalize that all the companies in this industry repositioned themselves into any of these three tiers. IBM, for example, continued to manufacture critical hardware components and software for its computers. But it can be argued that it became increasingly difficult for them to compete on each of these three tiers simultaneously as they required drastically different competitive strengths [3]. Apple, for example, continues to be vertically integrated but has limited its presence in a niche area.

But this was not all that made the computer behemoths uneasy. Recognizing this new opportunity as an assembler, Micheal Dell started selling standardized PCs directly to the customers who were used to buying them from stores. This model saved the retail

markup of computers, which made a clear business case for entrepreneurial Michael Dell [4]. Not that big companies failed to take notice of such an happening, but their long legacy came in their way of adapting similar business models. This phenomenon provided companies like Dell enough breathing space to become a major player in the industry.

Another reason for Dell's exponential growth is because IBM's misjudgment of the PC revolution. 'IBM failed to realize the new product's significance, says David Bradley, one of the team of 12 who produced the PC at IBM'. In 1993, IBM stunned the world by reporting quarterly losses of \$8 billion, caused by increased competition and a changing market. IBM was failing to compete with the new breed of innovative software and hardware producers who could make computers much more cheaply. The drop in price of the mainframe computers by nearly 90% was an immense blow to IBM [5].

On the other hand, Dell's success and its extremely efficient supply chain became hard to replicate. 'It's like watching Michael Jordan stuff the basketball', said a prominent Wall Street analyst who follows Dell closely. "I see it. I understand it. But I can't do it" [6].

In 1993 Louis V. Gerstner arrived to take the CEO position of IBM., having previously served as chairman and CEO of RJR Nabisco and president of American Express. After arriving he took several strategic decisions to turnaround the company. The turnaround began in a tidal wave of layoffs, a cultural revolution for a company that was one of the first to provide group life insurance, survivor benefits and paid vacations. 'Next, Gerstner turned the company's focus from just hardware to software and services under the banner

of IBM Global Services. Five years later, the Armonk, N.Y.-based company posted profits in excess of \$6 billion. Not everything he did worked. Despite lavish investments in development and marketing, OS2 couldn't bump off Windows, and the diversion gave Sun and HP time to beat IBM at the Unix game. And IBM's PC business continues to circle the drain thanks to its inability to meet the "direct" challenge head on' [7].

IBM moved further away from the hardware business to the services business as computers started to become commoditized. IBM started to focus more on the middleware and the application integration domain as the Internet boom started to ramp up. But at this time Dell further increased its operational efficiency to make the PC computer market even more commoditized. IBM started outsourcing its manufacturing. 'It signed deals with Sanmina-SCI and Solectron to manufacture workstations and desktops as well as handle custom configuration of ThinkPad notebooks' [8]. Finally, in December 2004, IBM sold off its PC business to Lenovo of China for \$1.25 billion, retiring from an era it helped to start.

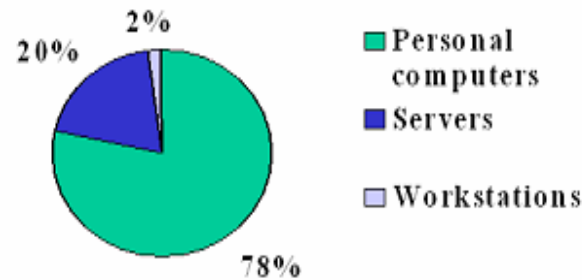
'After eating everyone's lunch in the US biz, they're (Dell) now aiming at printers and storage' [9]. Dell still kept on chasing the big players by moving upwards in the value chain. On the other hand, IBM has started to focus on more high value added services and specialized servers to differentiate itself in the marketplace. It will be interesting to see how these new changes in the industry shape the future of computer business.

## 3 Industry Overview

### 3.1 Snapshot of the Present Computer Industry

For this research project, the computer hardware industry is defined as the OEM manufacturers and sellers of finished computers, but does not include the component manufacturers that supply to the OEMs. With this definition, the computer industry can be segmented into three broad groups based on the nature of the final products, namely, the personal computers, the servers and the workstations. Since these three product groups meet distinct customer needs and requires different manufacturing and sales capabilities, firms in this industry often compete in each of these product groups separately. The personal computer segment, which is by far the largest segment, includes desktops, notebooks and other computer peripherals targeted towards both business and consumers. The server segment includes mainframes and supercomputers targeted towards businesses and high end research institutions. The workstation segment is comprised of high-end computers that are used for engineering purposes. The size of the computer hardware industry was \$228 billion in 2003, out of which the personal computers represented 78% of the total sales or \$177 billion in revenue, servers represented 20% of the sales or \$45 billion in revenue and workstations represented 2% of total sales or only \$4.5 billion dollar in revenue (Fig. 3.1). This clearly shows that the personal computer business is by far the largest segment in the whole industry.

### Worldwide Sale of Computer Hardware (\$228B) in 2003



Source: Standard & Poor's and IDC

**Fig. 3.1**

e

following chapters discuss some of the important phenomenon of each of the three segments of the computer industry.

## 3.1.1 Personal Computer Segment

### 3.1.1.1 Growth

The personal computer segment, because of its large revenue share, is fiercely competitive. Due to lackluster demand from the corporate sector after 2001 because of the economic downturn and dot-com bust, the growth of this segment was primarily driven by consumer demand. Within the personal computer category, notebooks has driven the majority of the new sales because of aggressive price cuts and improved technology. In many cases, notebooks are replacing desktop sales as the notebooks have become comparable to desktops in terms of price and performance. Europe Middle East and Africa (EMEA) has surpassed US in terms of growth rate of new notebook sales. The market size for personal computers in EMEA grew at a rate of 18.8% in 2003 compared to that of 11.4% of the US in the same year. This has made companies invest in the

operations of these growing geographies. In spite of this growth, the US remains the largest market for personal computers representing almost 40% of global sales by revenue.

### 3.1.1.2 Geographic Penetration

The sales of personal computers were restricted to the developed world for a long time. Though the trend is changing fast, statistics show that majority of the worldwide sales came from of a handful of countries. According to the data from Euromonitor, 70% of the worldwide retail sales of personal computers were restricted to only seven countries. USA topped the list with 26% of total sales, followed by UK (11%), China (10%), Germany (8%), France (7%), Russia (5%) and South Korea (3%) (Fig 3.2). The high computer penetration of China is a proof of its rapid growth and acts as a prelude for other developing countries to follow.

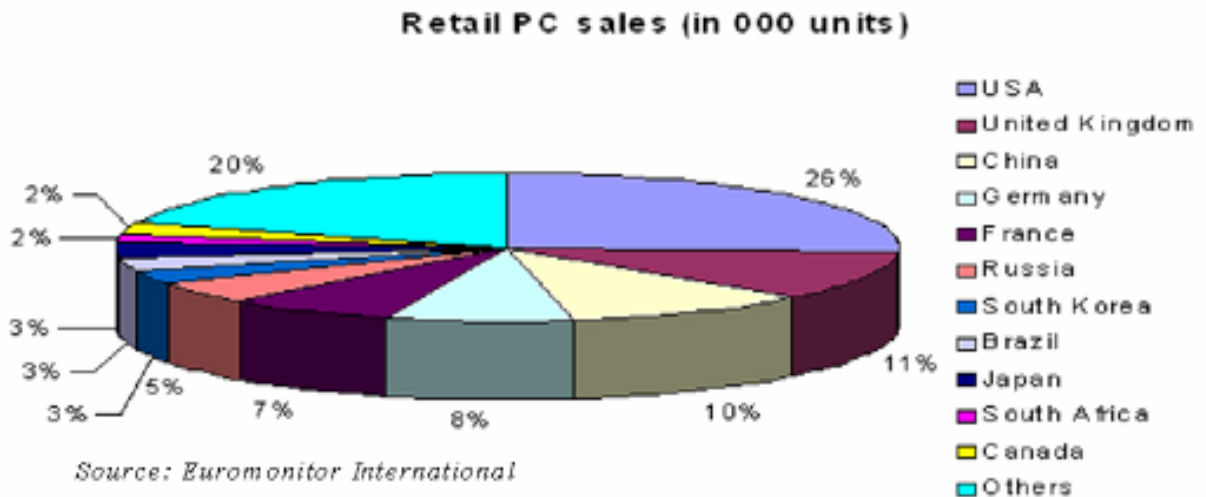


Fig 3.2

Source: Standard & Poor's and IDC

### 3.1.1.3 Competition

Because of price pressures, the personal computer industry is fairly consolidated, with only five companies dominating nearly 44% of the total industry revenue. In 2003 Dell topped the market with 17% share of the total number of units shipped, closely followed by HP with 16% and IBM with 6% of the share (Fig 3.3). However, HP overtook Dell in the fourth quarter of 2003. The other two major players were Fujitsu and Siemens, which accounted for 4% and 3% of the market (unit shipped) respectively. Other than these handful of top competitors and a few other regional players, the rest of the market was highly fragmented.

**Worldwide PC Shipment Market Share  
(unit shipped) in 2003**

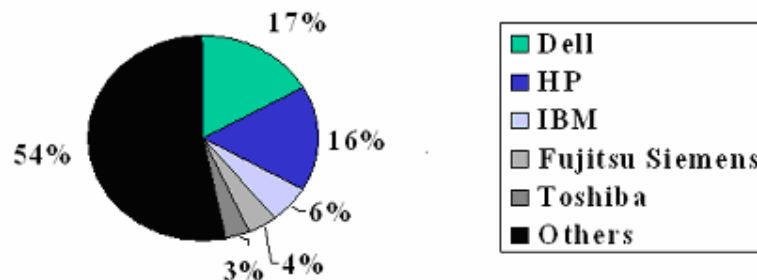


Fig 3.3

*Data Source: IDC*

## 3.1.2 Servers

### 3.1.2.1 Growth

The server market plummeted after the dot com crash in 2001 when the market slid by nearly 17%. The market again recovered in 2003 growing at a modest rate of 3.2%. The server market can be subdivided into three categories based on usability and performance

of servers, e.g. entry-level server, the midrange servers and the high-end servers. As the name suggests, the entry-level servers are used for light business applications mainly used by small and medium scale businesses. The increase in computational power of personal computers has made these entry-level servers vulnerable, which are often being replaced by high-end desktops. This has also created severe price competition in the entry level server market. But the sales of these entry-level servers have been still substantial because of increased spending by small and medium scale businesses. The Midrange servers are typically higher-end systems running the Unix operating system managing a large number of transactions and data. High-end servers include supercomputers, mainframes, minicomputers, and other high-end servers. These servers are primarily used by large businesses and institutions. The market for high-end servers has been falling because of restrained IT spending and decreased R&D expenditure by large corporations and research institutions.

### 3.1.2.2 Competition

IBM being the largest player in the server market accounted for 32% of the total revenue of \$ 45 billion in 2003. HP was the second largest player accounting for 27% of the total server revenue. These two companies collectively command nearly 60% of the total server market in 2003. The other big players are Sun (12%), Dell (9%) and Fujitsu (6%) (Fig 3.4). Because of the high entry barrier of the server market, nearly 86% of the total market share is dominated by only five companies.



### Worldwide Server Shipment Market Share (Revenue) in 2003

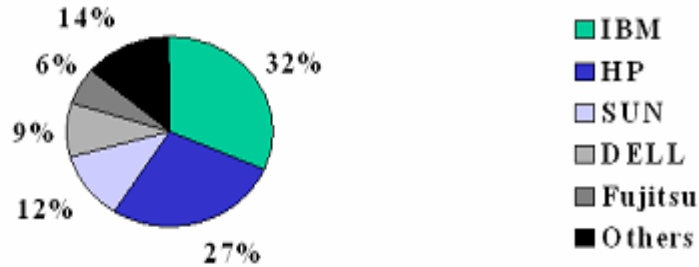


Fig 3.4

Data Source: IDC

Although, HP and IBM are the main players in the Server market, they have very different strategies. IBM is heavily focused on the high-end server segment, followed by the midrange, and with the least focus on the entry-level server segment. On the contrary, HP is mainly focused on the entry-level server segment, followed by midrange and least focus of the high-end server market segment. Their relative revenue from each of these segments reinforces that point (Fig 3.5). In 2003, IBM’s revenue from entry-level, mid-

### Server Revenue Share

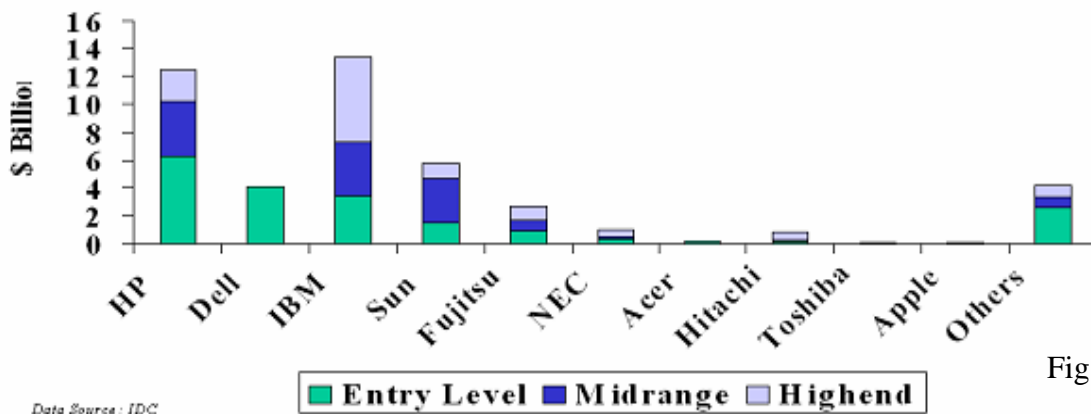


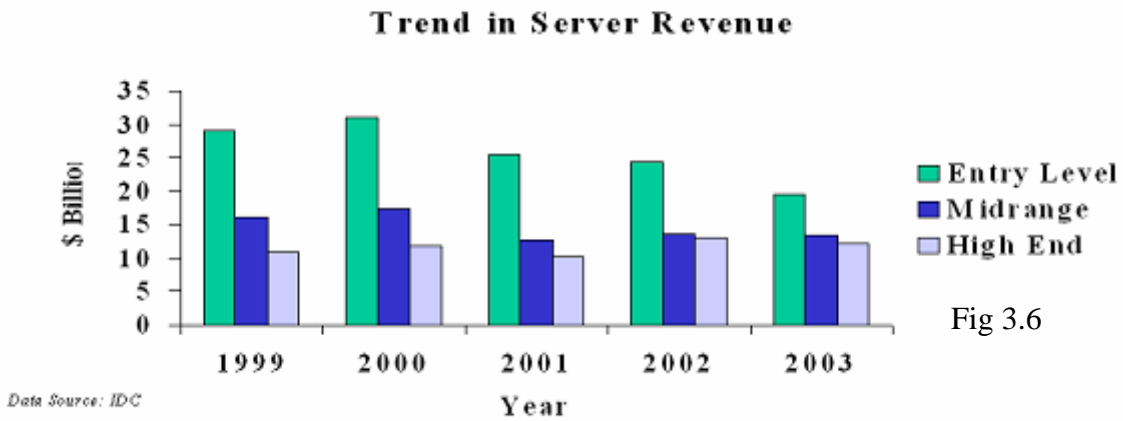
Fig 3.5

Data Source: IDC

range and high-end servers were \$3.3 billion, \$3.9 billion and \$6.1 billion, respectively.

On the other hand, in the same year HP’s revenue from entry-level, mid-range and high-end servers were \$6.2 billion, \$3.9 billion and \$2.2 billion respectively. Dell is more focused in the entry-level server segment with limited or no presence in the other two segments.

The entry-level servers have also shown a downward trend in net sales between 2000 and 2003 (Fig 3.6). A possible reason for this trend is because of the increased computational power of personal computers that has slowly eaten up this segment. Many small businesses have found it much more cost effective to use high-end personal computers instead of servers for non-mission-critical and lighter applications. The market for midrange to high-end servers has remained stable in the same time period because of the worldwide economic slowdown. The majority of the revenue of the midrange and high-end servers has come from maintenance, upgrades and the scaling up of existing systems.



### 3.1.3 Workstations

The workstation market has continued to fall from 2000. As personal computers have become stronger, they have increasingly become capable of handling many of the high-end engineering and scientific tasks that workstations traditionally used for. This is why the revenue share of workstations has constantly fallen in the recent past with 11% in 2003, 22% in 2002, 20% in 2001 and 10% in 2000 (Fig 3.7). Because of this trend, workstations now command only 2% of total revenue of the computer hardware industry.



Fig 3.7

## 3.2 Growth Drivers of the Personal Computer

### Industry

The personal computer industry, representing the largest share in the computer business, is fiercely competitive. Still, there are several avenues for growth for companies operating in the personal computer industry. The decreasing price of computers, increased penetration into low income group consumers, expansion into growing markets, market consolidation and diversification into related businesses are some of the high growth areas in this business. The following section discussed each of these growth areas.

### 3.2.1 Reducing Price of Computers

Though there were several factors that drove the growth of the industry in the past, one of the most prominent reasons was the reducing price of computers that made them affordable to a wider range of consumers. Technological advancement made computers cheaper and faster. The decreasing price of transistors, which used to cost over \$ 1 in the 1960s now cost only a millionth of a dollar in the 2000. Such advancements show that even if a computer chip now contains a magnitude of times the number of transistors that it used to contain in the 1960s, the price of the chips would still be less in the order of magnitude (Fig 3.8).

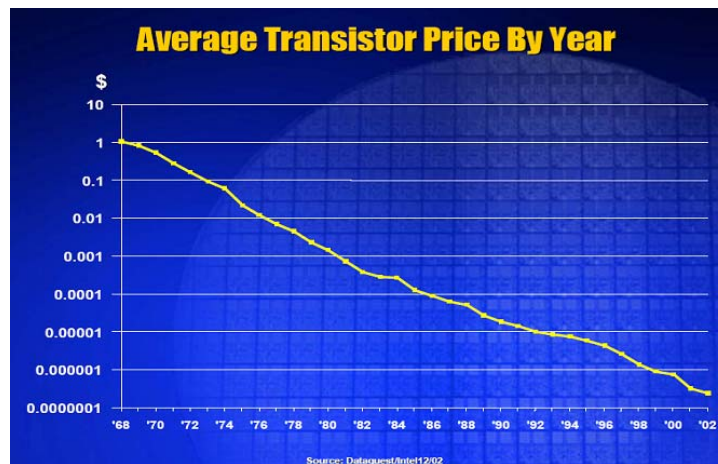


Fig 3.8

This downward trend in cost is visible in almost all other kinds of computer components that go into personal computers, servers and workstations, making computers more affordable. To give an example, the average price of a personal computer has fallen from \$1,700 in 1999 to well below \$1,000 in recent years (Fig 3.9). What magnifies this difference even more is that an average computer of 1999 can only be compared to a low-

end computer of recent years, which would be even less expensive. This trend of reducing price has been exponential in the laptop segment. Until 2000 laptops were largely restricted to high-ranked executives in the corporate world because of their significant price premium. The limited computational power of laptops was another reason for its restricted use. But over the past few years the price of laptops has fallen drastically along with the increase in computational power. This has made laptops comparable to desktop computers and has attracted many new consumers. It is expected that this downward trend of computer pricing will continue in the future and drive further penetration.

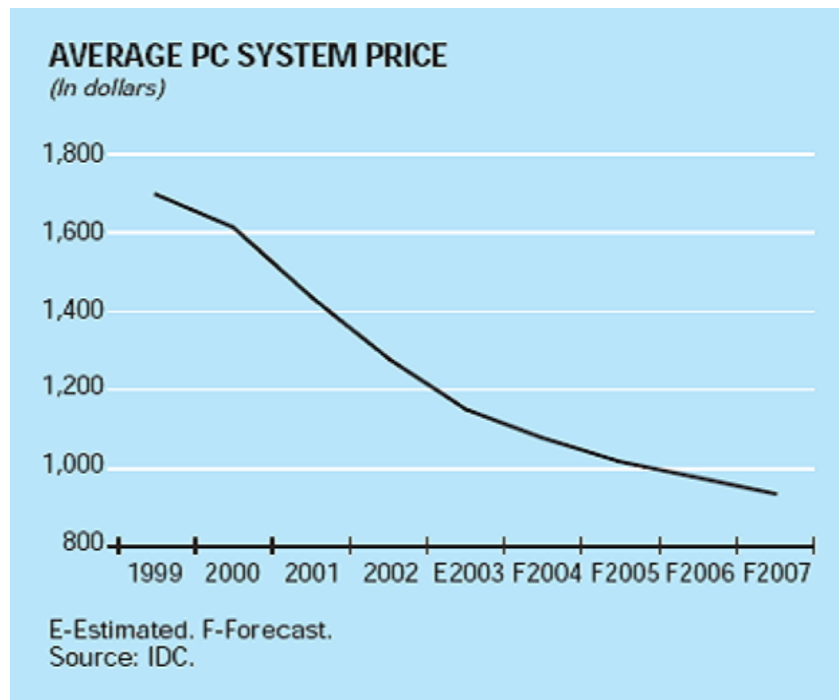


Fig 3.9

### 3.2.2 Increased Sales to Low-Income Groups / Small Businesses

Another growth area of computers is from the increased sales to the low-income group consumers who traditionally could not afford a computer. The high and medium income group consumer market is almost saturated in most of the developed countries. For example, in the US nearly 98% of the high-income group and 85% of the middle income group had access to a personal computer in 2002. On the other hand, in the same time period only 70% of the low-income group had access to a personal computer (Fig 3.10). In developing countries, though there is still market potential in the high and medium income groups, there is lot of opportunity for growth in the low-income groups. Small businesses are another potential growth segment for increased sales of computers. Due to the ubiquitous use of computers and their decreasing prices, many small businesses have started to use computers for their daily operations.

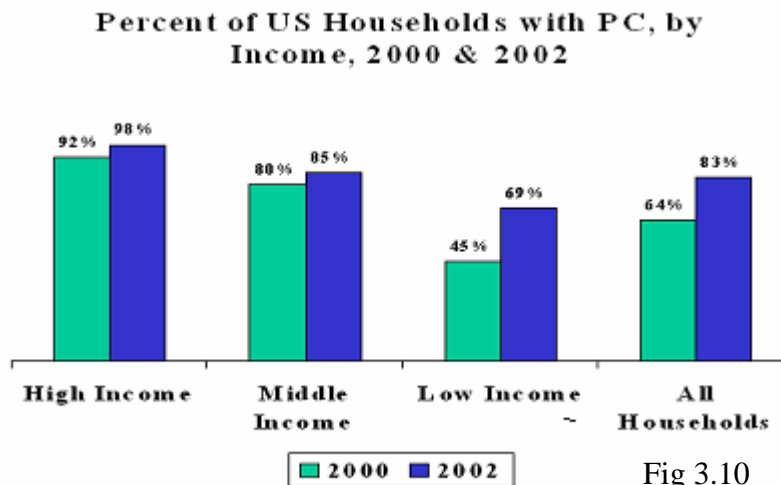


Fig 3.10

### 3.2.3 Geographic Penetration

Countries outside the US are catching up fast in terms of sales of computers. For example, only 24 out of 100 households residing outside the US own a personal computer

(average of top 70 countries in terms of PC sales) compared to 70 out of 100 households inside the US (Fig 3.11). This shows significant market potential of personal computers in the developing countries in the near future. Many of the large companies such as IBM are experiencing higher growth in countries outside the US.

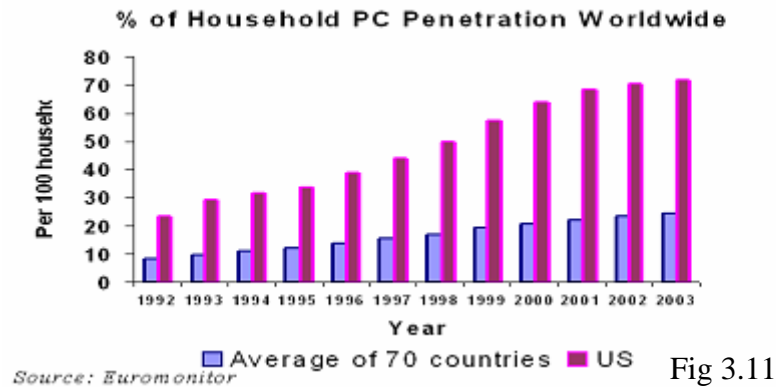


Fig 3.11

### 3.2.4 Market Consolidation

Through consolidation, companies have achieved economies of scale that have helped them to reduce computer prices, increase service offerings and provide better customer support. For personal computers, the total market shares of the top two vendors have progressively increased from 20% in 1997 to almost 40% in 2003 (Fig 3.12). Mergers and acquisitions between existing large companies have played a central role in consolidation. In 2001 HP and Compaq merged to overtake Dell in the US market. In 2004 Gateway and eMachines merged to overtake IBM in the US market. Also IBM sold off its shrinking PC business to Lenovo of Japan towards the end of 2004. This has made Dell and HP by far the largest companies in the PC industry.

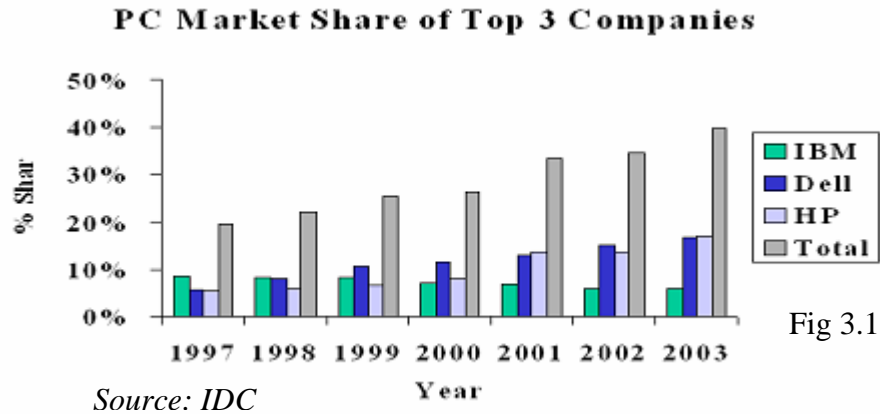
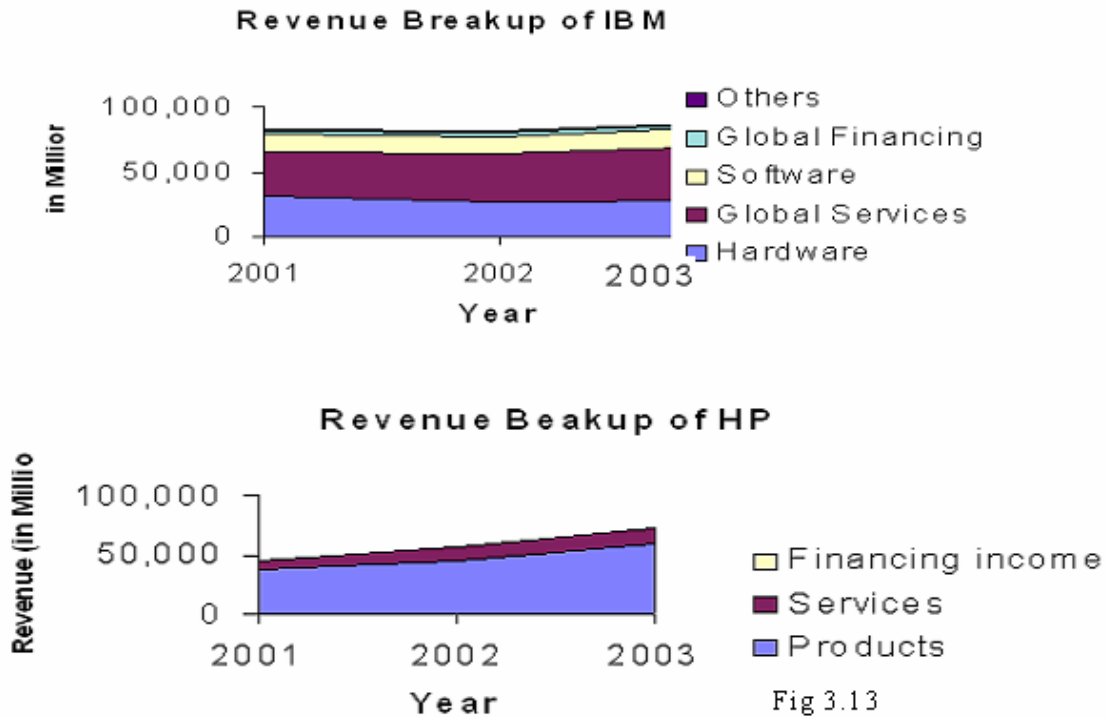


Fig 3.12

### 3.2.5 Diversification

With declining margins on personal computers and servers, companies have diversified into many ‘value added’ services businesses. For example, IBM has consciously moved away from being a computer hardware manufacturer to being a complete IT solutions provider, as personal computers became like a commodity product. The computer hardware business contributed only 32% of IBM’s total revenue in 2003 whereas services comprised nearly 47% of IBM’s total revenue. Similarly, services and financing businesses contributed to 20% of HP’s total revenue in 2003 and is growing (Fig 3.13).





Source: 10k Reports

Fig 3.13

### 3.3 Competitive Strategy of Various Vendors

Interestingly, in spite of the remarkable success of the large players such as IBM and Dell, both of these companies have very different competitive strategies. IBM, for example, moved away from being a hardware manufacturer to being a one-stop IT solutions provider as computers became a commodity like product. IBM's world-class customer fulfillment processes and seamless coordination between different business units support this business strategy. On the other hand, Dell has remained focused on

selling computers at the lowest price by constantly squeezing cost out of its supply chain. Dell's direct sales to customer and build-to-order manufacturing system support its "low cost" business strategy. The large players are also focused on different geographies. HP's geographic leadership is in the EMEA region, whereas both IBM and Dell have focused on the US market (Fig 3.14).

### Competitive Landscape

Vendors	2003 growth rate (unit sales)	Geography Presence – leadership	Customer Focus	Competitive focus
HP (US: 2)	21.4%	WW -EMEA (1)	Consumer Corporate	Diversified, Low cost
Dell (US: 1)	19.7%	WW -US (1)	Corporate Consumer	Low Cost
IBM	17.7%	WW –US (3)	-	Diversified, more online
Fujitsu Siemens	15%	WW -Europe	-	-
Toshiba Corp	23.2%	WW	Consumer	Low cost notebooks

Fig 3.14

The OEM (computer assembly) industry is further divided into three tiers in terms of competition between companies. The tier 1 companies are large players such as Dell, IBM and HP that usually have strong brands, marketing power, large volume, global distribution capacity, corporate reputation and professional services & support. The tier 2 companies are medium-sized companies, such as Gateway and Toshiba, which have known brands and are usually focused in a particular geography. The third tier is also known as the "white box market" comprising of local computer assemblers. Their strengths are low cost, local service and custom configuration and installation. The white

box market has the largest share in the small businesses in the US. Through industry consolidation the tier 1 companies are increasingly penetrating the tier 2 and the white box market. The low price advantage of the “white box market” is increasingly being challenged by process innovation and economies of scale of the medium and large companies (Fig 3.15)

### Computer Industry Structure

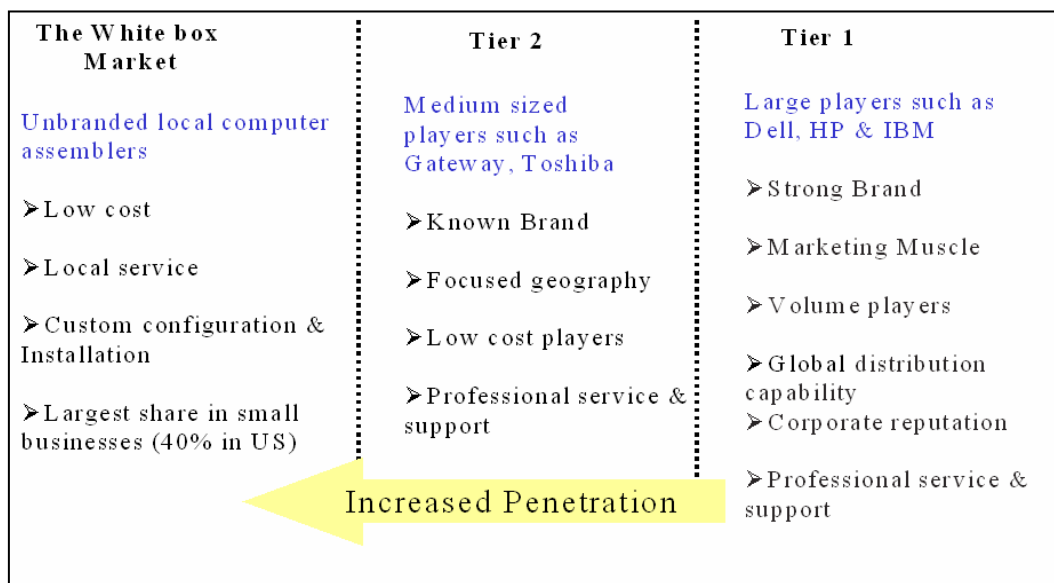


Fig 3.15

The computer industry is broadly divided into computer assemblers and component manufacturers. Companies like IBM, Dell and HP are mostly computer assemblers, although IBM and HP also manufacture some of their own parts. Companies like Intel, AMD, and EMC are part of the component manufacturers that are the suppliers to the OEMs. The competitive dynamics between the firms in these two segments of the industry are very different. The OEMs own the customers, set industry standards, compete on low cost, variety & service offerings, and often group together with

component suppliers to differentiate from competitors. On the other hand the component manufacturers focus significantly on technology, compete on technology development, have significant bargaining power over the assemblers and are the primary drivers of the product lifecycle and upgrade cycle of the industry.

The Electronic Manufacturing Services (EMS) industry sector continues to expand at a greater rate than the end market, as the OEMs continue to outsource their manufacturing to them. Over the years the EMS industry has evolved from being a low-cost sweatshop to offering high value added services including custom-built high-end systems development, new product designs and product delivery. This trend is the result of OEMs focusing on their own core competencies such as research and development or marketing, while outsourcing manufacturing to contract manufacturers who can perform the service cheaper and faster. The shortening product lifecycle of computers has also pushed the OEMs to outsource high-end services to their EMS providers. Companies such as Flextronics International actively partners with OEMs to help them go to market faster, minimize their manufacturing risks and manage their customer demand. The OEM in such a partnerships ends up maintaining the product brand and customer relationships, conceptualizes new products and develops core new technologies to constantly differentiate in the marketplace.

‘Looking to the future, the EMS supplier will have to develop entirely new concepts of support in order to reach tomorrow's expected level of service. As an example, Flextronics has established eight Product Introduction Centers around the world. At these sites, a customer's engineering staff can work with Flextronics to move a product from

concept to volume production, getting assistance in everything from PCB board layout and design to prototype assembly' (Electronic News, The next step for Contract Manufacturing, February, 1999). EMS is expected to play a greater role in the computer industry as it continues to become more competitive in the future.

## 4 Company's Position in Industry

### 4.1 IBM's Position in the Industry

#### 4.1.1 IBM's History

Though IBM was incorporated in 1911 as Computer-Tabulating-Recording (CTR) Company, its history goes back to 1891 when a German immigrant Hollerit founded the Tabulating Machine Company in 1896. In 1911 a merger between the Computer Scale Company of America and the International Time Recording Company resulted in Computer-Tabulating-Recording Company. In 1924 because of its increasing worldwide presence, the name of the company was changed to International Business Machines (IBM).

Starting from this early era IBM had led its way as the frontrunner in computer technology and innovation. From large computers based on vacuum tubes such as the IBM 701 to fully transistorized mainframes, IBM's contribution to the development of the computer industry has been significant. In 1964 IBM launched its system 360, which was a family of computers with interchangeable hardware and software. This brought in a new revolution to the computer industry and gave birth to today's multi billion-dollar hardware and software industry. IBM started relationships with Intel for microprocessors and Microsoft for operating system that led to the fundamental shift in power equation in the whole industry. IBM's lack in commitment to the emerging personal computer industry and client server based systems contributed to its huge loss of \$8 billion in 1993.

But under the aegis of CEO Louis Grestner IBM recovered back to its earlier state of glory. Today IBM is a diversified company where it has positioned itself as an IT solutions provider rather than only a computer hardware manufacturer.

## 4.1.2 IBM's Business Units

IBM is divided into four business groups - the Hardware Group, the Software Group, the Global Services Group and the Global Financing Group.

**Hardware Group:** The hardware group consists of three sub-groups: Technology, Personal Systems and Systems.

- a. Technology:** The Technology group is the core R&D group of IBM that is responsible for developing the core technologies that are used in IBM computers such as microprocessors and application-specific integrated circuits. This group also does advanced foundry operations for internal use as well as for other partner companies. The Technology group also provides engineering and technology services on behalf of the services business of IBM to its clients.
- b. Personal Systems:** The Personal Systems Group manufactures personal computers, printing systems and various retail points of sales solutions.
- c. Systems:** The systems group manufactures IBM's flagship server and storage products.

**Software Group:** IBM's Software Group manages the DB2 information management software, Lotus software, Rational software, Tivoli software and the Websphere software.

**Global Services Group:** The Global Services group is one of the largest groups in IBM that consist of the Business Consulting Services, On Demand Innovation Services (ODIS), Application Management Services, E-business Hosting Services, Integrated Technology Services (ITS) and Strategic Outsourcing Services.

**Global Financing Group:** The Global Financing group consists of Customer Financing, Commercial Financing and Remarketing. This group provides financial services to its customers for its various products.

### 4.1.3 IBM's Value Proposition

IBM recognizes its value proposition to its customers in terms of business value, infrastructure value and component value.

IBM's business value proposition is to provide software and services to its clients to improve their business performance. IBM's strategy is to drive on-demand business innovation in its clients businesses. Table 4.1 shows some of the capabilities and the delivering groups that IBM brings together to offer business value to its clients.



**IBM's Business Value Capabilities and Internal Groups (Table 4.1)**

<b>Capabilities:</b>	<b>Offering Group</b>
Business Consulting Services	Global Services
On Demand Innovation	
Customer financing	Global Financing
Engineering & Technology	Technology Group
Software and services	All IBM Groups

IBM's infrastructure value proposition is to provide hardware, software and services integrated into a computing environment to its clients. IBM's strategy is to drive open and integrated systems and solutions. Table 4.2 shows some of the capabilities and the delivering groups that IBM brings together to offer infrastructure value to its clients.

**IBM's Infrastructure Value Capabilities and Internal Groups (Table 4.2)**

Capability	Offering Group
Application management	Global Services
e-business Hosting Services	
Integrated Technology	
Strategic Outsourcing	
Personal computers	Personal Systems Group
Printing systems	
Retail Store Solutions	
Commercial financing	Global Financing

Remarketing	
Storage	Systems Group
Servers IBM eServer systems using IBM operating systems (zSeries and iSeries), as well as AIX, the IBM UNIX operating system (pSeries) and the Microsoft Windows operating system (xSeries). All servers can also run Linux, a key open-source operating system.	Systems Group and Software
DB2 information management software	Software
Lotus software	
Rational software	
Tivoli software	
WebSphere software	

IBM's component value proposition is to offer advanced semiconductor development and manufacturing services for IBM's own server and storage offerings, along with services, and technology licenses to others OEMs. IBM's strategy is to leverage components for Infrastructure Value, continue to participate in select markets and to pursue outsourcing for manufacturing of select products of other OEMs.

#### 4.1.4 Sales and Distribution Channels

IBM has two distinct channels for sales and distribution of its products and services: the direct route to market and business partner route to market.

The direct route is IBM's own sales force of its different business units. To target large and complex businesses, IBM uses its own consultants who design in-depth solutions for its client's business problems. IBM also sells hardware, software and systems through brand specialists to self-integration IT departments of companies. For consumer sales, IBM largely uses its [ibm.com](http://ibm.com) website for online transactions.

The business partner route to market is IBM's distribution channel of products and services through partner vendors. These partner institutions are mainly major independent software vendors, systems integrators, regional service providers, solutions providers, resellers and distributors.

#### 4.1.4 Revenue and Net Income

IBM's revenue has remained stable over the last decade. Its profitability has steadily increased in the same time period with the only exception being in 2002 when it declined sharply (Fig 4.1).

**IBM's Net Sales and Net Income over 94-03**

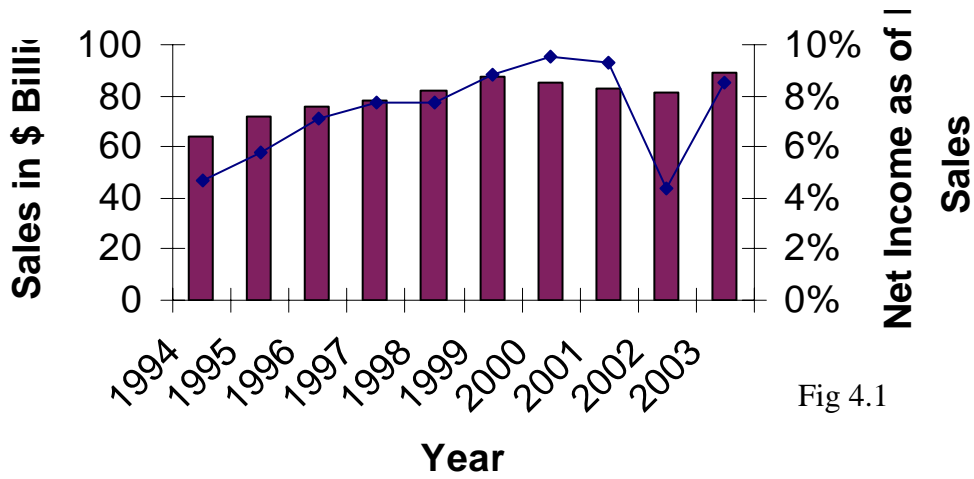


Fig 4.1

Although the net revenue has remained stable, the relative revenue shares of different business units have changed significantly. This phenomenon is particularly visible for IBM's hardware and services businesses where the hardware business has steadily shrunk, whereas the revenue from the services arm has steadily increased (Fig 4.2). This is partly because of the reducing profit margin and increased commoditization of computer hardware products.

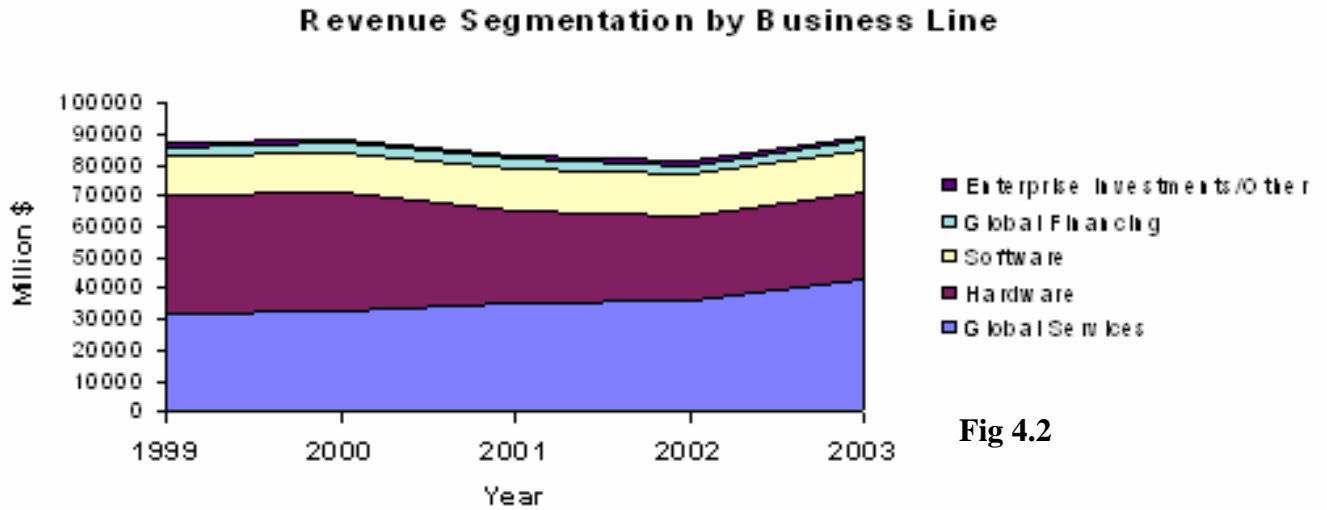


Fig 4.2

The revenue share of each of IBM’s business is not the same share as its relative profitability. The Global Services business that accounted for nearly 48% of the total revenue in 2003 represented only 33% of net profit (Fig 4.3). Similarly, the hardware segmented accounting for 32% of total revenue in 2003 represented 24% of net profit. On the contrary, the software business that accounted 16% of total revenue in 2003 represented over 37% of total profit. In terms of profitability, IBM’s software business is most profitable followed by the hardware and services business.

### Revenue and Gross Profit Share of Different Business Units

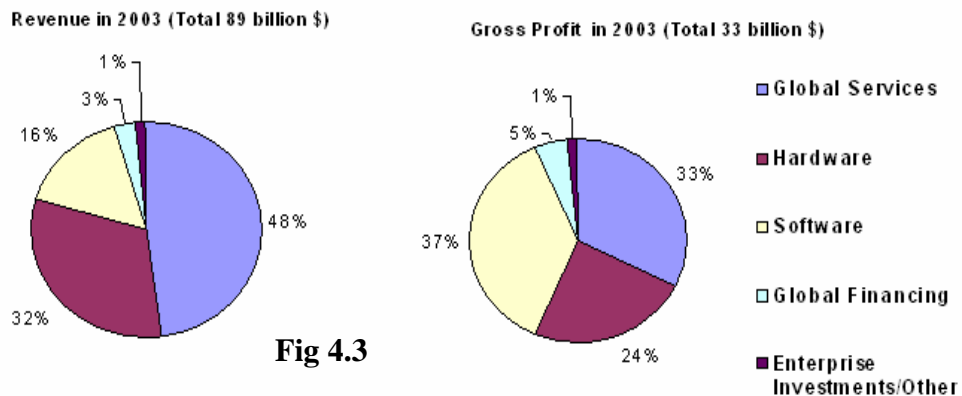
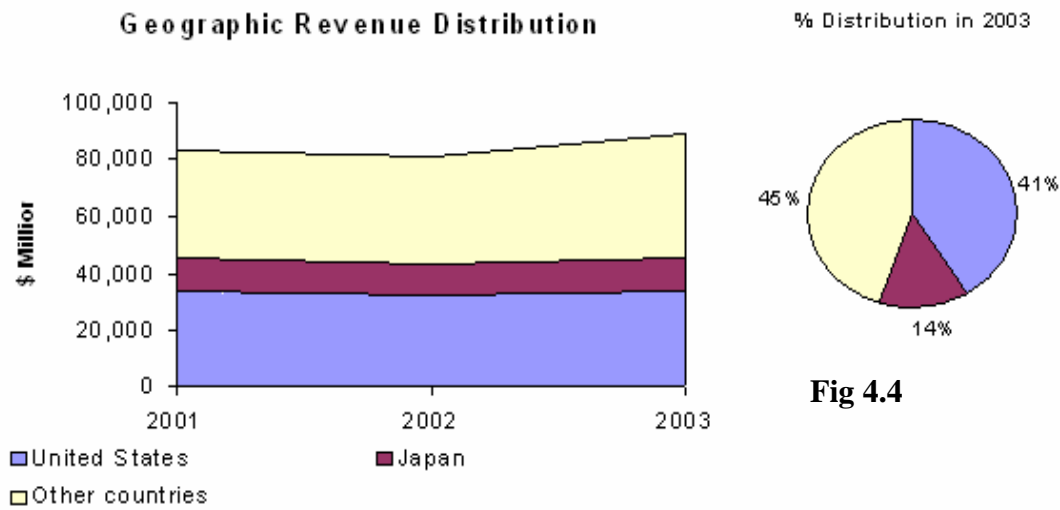


Fig 4.3

In terms of geographic presence, even though the US is the largest market for IBM, its revenue from other countries have steadily increased over the years. In 2003, 41% of total revenue came from sales in the US, followed by 14% from Japan and 45% from the rest of the world. With the saturation of the US market, IBM’s share of revenue from the US has slowly declined.



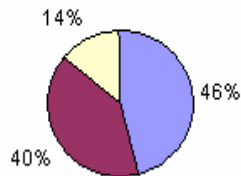
IBM’s main customer segment is financial services that accounted for 25% of total revenue in 2003 followed by Small and Medium Businesses (22%), Public Sector (16%), Industrial (13%), Distribution (9%), Communication (9%) and OEM (3%) (Fig 4.5).

2003 Sales by Sector		
	\$ mil.	% of total
Financial services	22,323	25
Small & medium businesses	19,809	22
Public sector	13,977	16
Industrial	11,763	13
Distribution	8,079	9
Communications	8,009	9
OEM	2,634	3
Other	2,537	3
<b>Total</b>	<b>89,131</b>	<b>100</b>

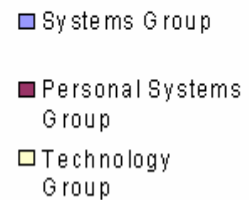
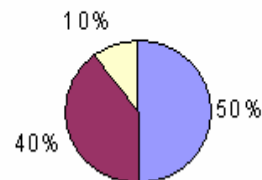
**Fig 4.5**

Inside the hardware segment, the systems group is the fastest growing segment that grew from being 46% of total hardware revenue 2002 to 50% in 2003 (Fig 4.6).

**Division of Hardware Revenue in 2002**  
(Total 27 Billion \$)



**Division of Hardware Revenue in 2003**  
(Total 28 Billion \$)



**Fig 4.6**

## 4.2 Dell’s Position in the Industry

### 4.2.1 Dell’s History

In 1983 Michael Dell started the business that gave birth to what today is Dell Corporation. At age 18, while attending the University of Texas Austin, Michael Dell

spent his weekends and evenings pre-formatting hard disks for IBM –PC compatible upgrades. He was delivering the upgrades door-to-door to local businesses. With the simple concept of upgrading IBM computers and delivering directly, he was selling \$6 millions worth of computers by 1985. High growth rates and attractive margins allowed Dell to fund growth internally, and Dell began to get increasing numbers of orders. Subsequently Dell changed its focus from upgrading to assembling its own PCs. By 1990, Dell was selling \$500 million worth of computers. Dell has been profitable since its very beginning. It showed losses only once in 1993.

Dell's product line evolved with the PC market. Today, Dell offers several modules of desktops, portables, servers and workstations. From 1999 Dell started to offer more value added solutions by providing services such as customized software and peripherals installations and financing. From there Dell didn't have to look behind to reach where it is today, a \$40 billion company [10].

## 4.2.2 Dell's Business Strategy

Dell's business strategy is to be the lowest price provider of standardized computers. Its operating model of direct sales to customers and build-to-order manufacturing supports this strategy. Dell's commitment to standard-based technologies is one of the main reasons for its successful operating model. Standard based products have helped Dell to do product customization and continuous up-gradation of technology without significant process changes.



### 4.2.3 Dell's Product Portfolio

Dell's product portfolio is divided into two groups. The "Business and Large Institutions" group consist of high performance servers (PowerEdge, PowerVault, PowerApp), Desktops (OptiPlex), workstations (Precision), and notebooks (Latitude). The "Consumer" group consists of cost-effective desktops (Dimension) and notebooks (Inspiron) products.

### 4.2.4 Revenue

Dell's revenue in 2004 increased to \$ 41 billion from \$35 billion in 2003 (Fig 4.7). The average yearly revenue growth from 2002 to 2004 was around 15%. The gross margin also grew to \$7.5 billion in 2004 from \$6.3 billion in 2003. Dell's average yearly gross margin growth from 2002 to 2004 was around 17%. This proves that Dell has succeeded in increasing net revenue as well as reducing operating cost between 2002 and 2004. Dell's operating expense as a percentage of revenue has decreased from 11.9% in 2002 to 9.7% in 2004.

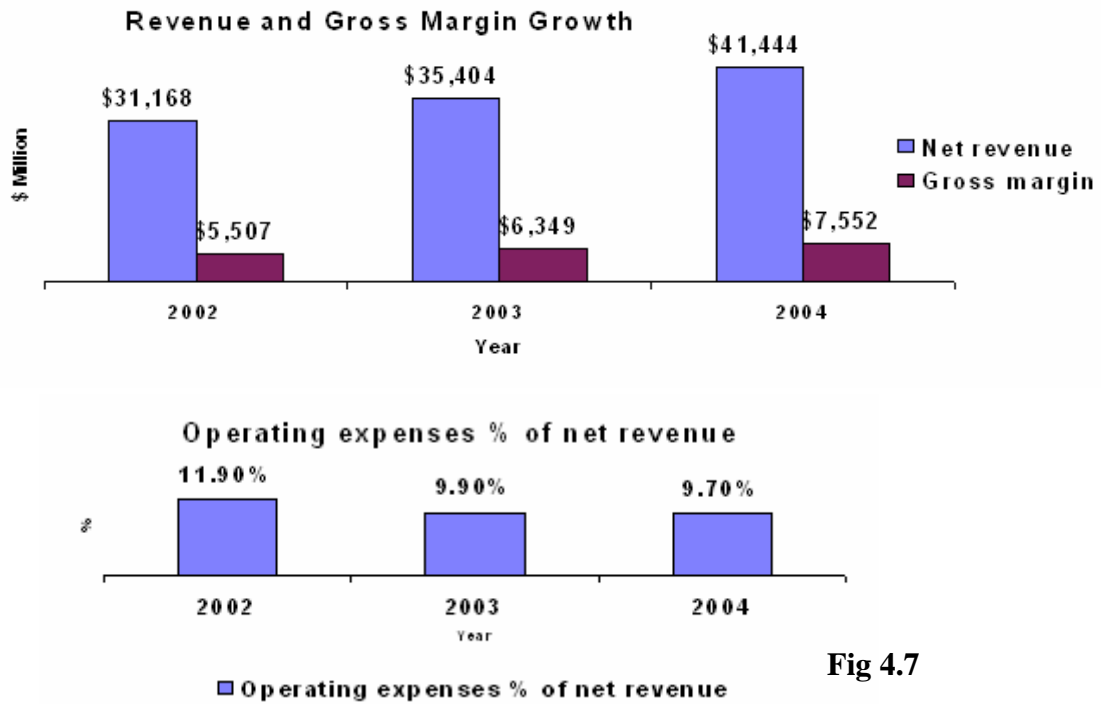


Fig 4.7

**Revenue breakdown**

Dell’s major revenue source is its corporate clients that accounts for 85% of its total revenue. The rest of the revenue (15%) comes from sales to consumers (Fig 4.8).

**Revenue Breakdown of Dell based on Customer Type**



Fig 4.8

US is the largest market for DELL that accounts for 70% of the total revenue, followed by EMEA (Europe, Middle east and Africa) that accounts for 20% of the total revenue and APAC (Asia Pacific) that accounts for 10% of the total revenue.

### Revenue Breakdown of Dell Based on Geography

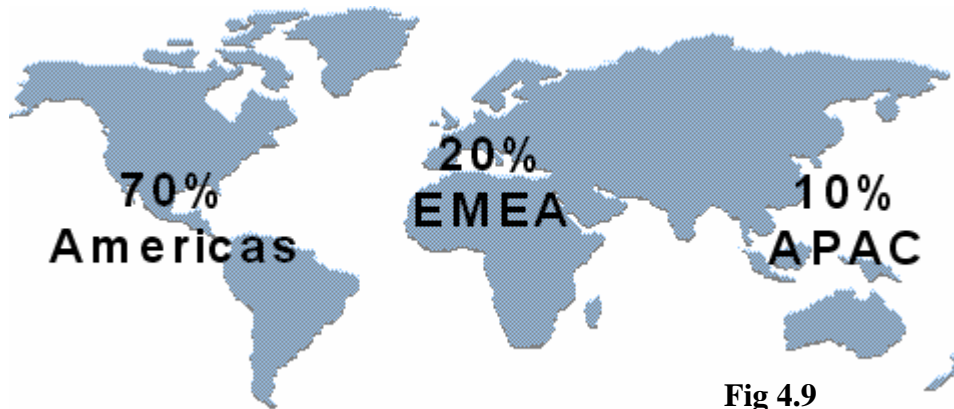


Fig 4.9

### 4.2.5 Marketing Strategy

Dell's marketing strategy is aligned to its customer segments. Dell has dedicated account teams, field based system engineers and consultants, and does global pricing, special promotions and single source of assistance for its larger corporate, government and institutional (healthcare and education) clients. On the other hand Dell uses television, Internet, mail, newsletters and stores in certain states and non-US locations to cater to its small and medium scale businesses and individual consumers. Dell often provides promotional prices for such customers based on inventory availability.

### 4.2.6 Competition

Dell has led the market by achieving operational efficiency whereas both of its main competitors IBM and HP are focused towards services and life cycle support. HP, as the market leader, is a strong competitor in the printing businesses.

## 5 Company Specific Supply Chain

In this chapter the supply chains of each of IBM and Dell are discussed in detail. Each of these large companies has a diverse range of business interests in different product segments. Based on the competitive landscape of each of these product segments the supply chains are designed. For example, IBM's highly specialized server business targeted mainly for institutions buyers requires different supply chain capabilities from its more commodity like and price sensitive personal computer business. Similarly, Dell's new flat panel TV and handheld devices business is quite different from its flagship computer business. To focus the research, a particular supply chain from each of these two companies, that are representative of their world-class performance, is profiled. In the case of IBM, its specialized server business was researched, while in the case of Dell, its efficient personal computer business was researched.

### 5.1 IBM Server Supply Chain

The following statistics provides a snapshot of IBM's supply chain. The purpose of these statistics is to show the large size and complexity of IBM's supply chain operations and its relative importance within IBM as a group. These statistics are for IBM's whole hardware business, of which the server/systems group is the largest.

- Number of factories: 13 in 10 countries
- Number of suppliers: 33,000
- Number of products: 78,000
- Number of possible configuration of products: 3 million

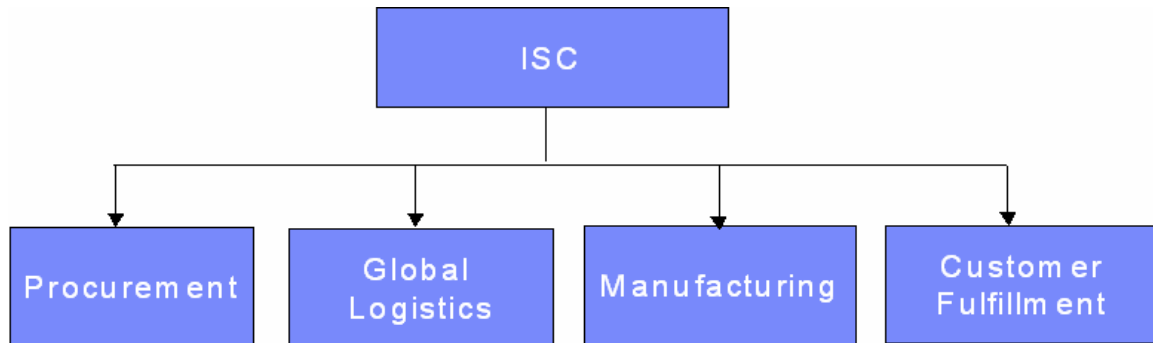
- Weight of goods that flow annually: 2 billion pounds

### 5.1.1 IBM's Supply Chain Organization

In January 2002, by creating a centrally managed group of supply chain professionals that transcended its traditional functional silos, IBM formed its 'Integrated Supply Chain (ISC)' group. The main objective of the group was to align IBM's internal capability to increase customer satisfaction. ISC now employs over 19,000 supply chain professionals across 100 locations in 59 countries. This group is accountable for roughly half of IBM's total cost and expense and has pioneered many cost saving projects for IBM in the past.

The ISC is comprised of four subgroups - 'Procurement', 'Global Logistics', 'Manufacturing' and 'Customer Fulfillment' (Fig 5.1). The 'Procurement' group is responsible for the procurement of components, systems and services from IBM's supplier base that is located around the globe. This group employs over 3,700 procurement professionals located in 59 countries and 212 locations. The 'Global Logistics' group is responsible for movement of goods from supplier locations to manufacturing facilities and finally to the customers/end consumers. This group also manages warehousing, returns and after market sales for IBM. The logistics group employs over 1500 logistics professional who are located in 56 countries and 74 locations. The Manufacturing group is responsible for manufacturing and assembly of computers. This group has outsourced many of its activities in the past to lower cost jurisdictions. The Customer Fulfillment group manages all the front-end supply chain interactions and provides support to the sales and service teams.

### IBM's Integrated Supply Chain Organization



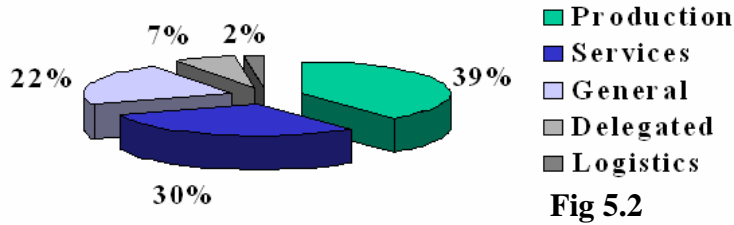
**Fig 5.1**

## 5.1.2 IBM's Supply Side Business Processes

### 5.1.2.1 Procurement

IBM procured over 4 billion dollar worth of products and services in 2003, which accounted for nearly 50% of its revenue in that year (Fig 5.2). This high procurement cost to revenue ratio makes the procurement function crucial to IBM competitiveness, both from its operational and financial performance standpoint. The major spending areas were production procurements (39% by value) and services procurement (30% by value). The large proportion of services procurement indicates IBM's increasing focus on the computer services business.

**Percent Spend in different areas in 2003  
(total procurement = 42 Billion USD)**



*5.1.2.1.1 Procurement Transformation*

IBM’s procurement function has undergone major transformation in the past few years. A few of the major changes were the addition of sourcing experts and procurement engineers in to the team, measurement of costs and savings contribution, reduction in bypassing, complete process and IT integration with suppliers and the automation of low touch customer transactions. The table below displays some of the objective measures of this transformation.

**IBM’s Procurement Transformation (Table 5.1)**

	<b>Early 1990’s</b>	<b>2003</b>
Sourcing Expertise in place	<10%	100%
Cost Savings Contribution	Data not available	\$6.7B
Supplier Quality	85%	99%

Escapes/Bypasses (Maverick Buying)	>35%	<0.2%
Acceptable Business Controls (Audits)	55%	100%
Client Satisfaction	40%	82%
Electronic Catalogs	0	500+
e-Enabled Suppliers	<500	33,000+
Electronic Purchases	<20%	98%
Buyer-less Transactions ("Hands-Free")	0%	99%
PO Processing time	30 days	<1 day
Contract Cycle Time	6-12 months	< 30 days
Contract Length <i>Source: IBM</i>	40+ pages	6-8 pages

#### 5.1.2.1.2 Source/Make Decision-Making

IBM has steadily increased outsourcing of non-core activities over the past many years. Because of outsourcing, both the absolute procurement expenditure as well as the ratio of procurement spent to total revenue has steadily increased for IBM over the years. The



commoditization of personal computer, computer accessories and certain point-of-sales businesses has accelerated this phenomenon. But in the server business, since IBM differentiates itself from competition through specialized technology rather than through low cost, it has largely refrained from outsourcing its core components and systems.

IBM outsources the standards-based technology components to a few selectively chosen suppliers. Selection and development of suppliers is more of a strategic issue because IBM believes in long-term supplier relationships rather than myopic contracts. But internally, IBM continuously follows the profit zone to outsource low profit components. One can question whether such a strategy may lead to complete outsourcing of all internal activities as the computer industry become more price competitive; the argument to the contrary is that such a situation is unlikely as IBM constantly develops new technologies to differentiate itself in the marketplace. IBM would most likely, as it does now, choose to keep these technologies in-house.

Mostly IBM outsourced vendors are located in Asia. The reason IBM outsources to Asia is not only because of the obvious cost advantage, but also because of the technology capability, quality consciousness and reliability of local suppliers in this region that meet IBM's high level of customer service. The high profit margin in the server business is another reason that quality and technology reliability are more important decision criteria for selecting suppliers rather than merely cost savings.

### 5.1.2.1.3 Supplier selection and supply chain design

IBM's focus on value added products and services requires its suppliers to be able to support IBM's high service level strategy. Moreover IBM's specialized servers require sophisticated technical capability and stringent quality control in its supplier organizations. Such requirements call for heavy upfront investment by the suppliers in their operations. Suppliers also have to commit on long-term capacity deployment as some of the products have long development lifecycles. This upfront investment and capacity commitment underpins the need for IBM to develop deep and trusted relationships with its suppliers. IBM gives market share commitments to some of its key suppliers to reduce their upfront investment risks. IBM also works closely with its suppliers to make sure that the business interests of both of the parties are aligned.

IBM requires its suppliers to manage inventory close to its manufacturing locations at their own cost. IBM takes ownership of the inventory only when it is required for production. Moreover, the supplier's IT systems and process needs to comply with IBM standards and be fully integrated with IBM. Process and IT readiness are two of the important criteria for the selection of new suppliers. The selection criterion is also tailored to the nature of the product that would be procured. Since many of the components are custom tailored for high-end servers, IBM maintains exclusive relationships with suppliers of such components and actively engages in their capability development. On the other hand personal computers are mostly comprised of industry-standardized parts, so suppliers of such parts are usually more independent, larger

companies serving multiple companies in the industry. These suppliers are usually quite matured and exert significant bargaining power in the value chain.

To reduce complexity and to develop exclusive relationships, IBM prefers to deal with a smaller number of large 'enterprise' suppliers who can cater to significant portions of its business. IBM encourages regional suppliers to become global as it helps IBM in consolidating procurement across geographies. IBM encourages mergers and acquisitions among its suppliers as it helps them to consolidate its supplier base.

#### 5.1.2.1.4 Supplier Segmentation

80% of IBM's business is concentrated in 20% of its suppliers. IBM's strategy is to develop a core set of suppliers to gain volume leverage and to develop long-term relationships. Even though IBM negotiates aggressively on supplier contracts, some of the long-term contracts are 'evergreen' as they have no end date attached. IBM has segmented its suppliers in four categories depending on the type of the supplier and on IBM's own supplier collaboration strategy (Fig 5.3).

**A. Regional/Niche:** This category of suppliers represents single commodity specialists that accounts for 25% of total procurement value. The regional/niche are usually dependent on IBM for a large portion of their business. IBM maintains exclusive relationships with such suppliers and actively participates in their development.

**B. Enterprise/Core:** This category of suppliers is the largest segment for IBM, comprised of world-class service providers that account for 65% of IBM's total procurement value. These suppliers usually supply standardized industry components.

**C. Non-strategic:** This category of suppliers mainly provides low impact/dollar value components that comprise only a small fraction (5%) of IBM's total procurement spend.

**D. Emerging opportunity:** This category of suppliers represents small firms that engage in developing new technologies for IBM. The total procurement value from such suppliers is only 5% of IBM's total procurement value. IBM uses such suppliers to develop new innovative technologies that become mainstream in the future.

#### IBM's Supplier Segmentation

<b>Regional/Niche</b>  (25% of purchase value)	<b>Enterprise/Core/Strategic</b>  (65% of purchase value)
<b>Non-Strategic</b>  (5% of purchase value)	<b>Emerging Opportunity</b>  (5% of purchase value)

Fig 5.3

For its new on-demand business initiative, IBM has developed a new supplier segmentation matrix that is called the 'Power Matrix'. As it is evident from the meaning of the word 'on-demand', this business philosophy requires highly responsive production and delivery systems aligned towards the unified business objective of higher customer service. For such a strategy to be successful, IBM needs to establish 'on-demand' procurement partnerships with its suppliers. The bargaining power of IBM and its supplier in the buyer-supplier relationship plays an important role in the success of such a model. The high bargaining power of IBM gives it an advantage to negotiate favorable terms with its suppliers to support 'on-demand' procurement. But the bargaining power may be necessary, but not a sufficient condition for such a model to be successful. The business interests of the suppliers also have to be aligned with that of IBM. Foremost of all, IBM has to convince its suppliers to commit huge amounts of upfront investments and buy into the philosophy. There should be sufficient reward for the supplier in the long term for them to be willing to partner with IBM.

The Power Matrix classifies the IBM-supplier power equation into four quadrants (Fig 5.4), which are buyer dominant (e.g. between IBM and certain logistics providers), Supplier Dominated (e.g. between IBM and Microsoft), Independent (e.g. between IBM and its enterprise suppliers), and Interdependent (between IBM and its commodity specialists suppliers).

**A. Buyer Dominant:** This kind of relationship exists with those suppliers who are dependent on IBM for a significant portion of their business. A good example

would be certain logistics providers who are dependent on IBM for a majority of their revenue. In such cases IBM can negotiate favorable contracts to align them for on-demand business.

Another example is of suppliers who supply specially-tailored components to IBM but do not have exclusive rights on the technology. In such cases, the suppliers usually cannot sell their components to anyone else, but IBM has the option of procuring them from elsewhere.

**B. Supplier Dominant:** This kind of relationship exists between IBM and those suppliers who make specialized components and sell to multiple buyers. In this case the suppliers usually have exclusive rights to the technology. A good example of such a supplier is Intel from whom IBM procures microprocessors (though IBM has its own microprocessor production). Microsoft can be another example from whom IBM procures operating systems. In such cases IBM would find difficulty in aligning the supplier for its on-demand business only by exerting buying power.

**C. Independent:** This kind of relationship exists between IBM and its enterprise suppliers who manufacture standardized parts and sell to multiple buyers. Just as the suppliers sells its components to multiple buyers and thus are not being overly dependent on IBM, IBM also has the option of procuring the same components from elsewhere. In such cases both IBM and the supplier are independent from each other for their respective business interests. This kind of a relationship is not

suitable for ‘on-demand’ business unless both parties abide by specific contractual obligations.

**D. Interdependent:** The interdependent relationship exists between IBM and its suppliers when the supplier makes custom-tailored components for IBM based on its proprietary technology. Such suppliers depend on IBM for a significant portion of their revenue, whereas IBM depends on the supplier as they cannot source the component from anywhere else. This kind of a relationship is ideal for on-demand business as both of them easily align with each other based on respective business interests.

### Buyer – Supplier Power Matrix

High	Buyer Dominance	Inter-dependence
Low	Independence	Supplier dominance

Low

High

**Fig 5.4**

#### 5.1.2.1.5 Supplier Management

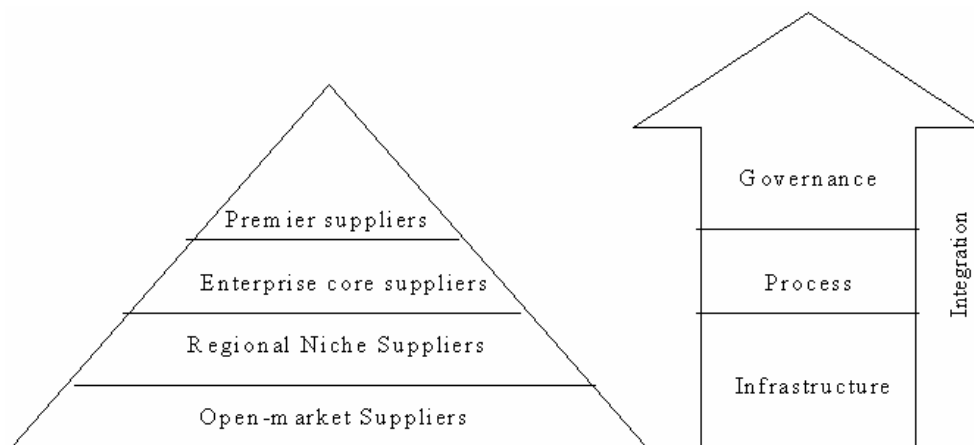
IBM has different integration strategies with its different supplier segments (Fig. 5.5).

With the premier suppliers IBM engages in ‘on-demand’ partnerships. IBM engages in end-to-end supply chain governance along with complete process and IT integration with

such suppliers. IBM does not encourage competitive bids from its premier suppliers and uses fair market price & analytical techniques to ensure competitiveness. Suppliers are also required to provide open-book cost information.

For enterprise core and regional niche suppliers IBM engages in process and IT integration to streamline collaboration. With the open market suppliers, IBM usually engages in only IT infrastructure integration to mainly enable electronic procurement.

### IBM's Supplier Integration



**Fig 5.5**

#### 5.1.2.1.6 Purchasing/procurement

IBM's procurement has pioneered in continuously reducing the cost of procurement of its various components. The driving factors for this achievement, as expressed by IBM executives, are the increase in skill sets of people within the group, a strong understanding of both supplier capability and IBM's strengths, and the integration of the procurement function with the product development processes. IBM has over 700



specialized engineers in the procurement team. Sourcing decisions are made as part of product development processes.

The strategic commodity councils are central to IBM’s procurement strategy. IBM has 13 services and general councils and 19 product councils. The commodity councils are central to the sourcing strategy of each commodity type. The commodity councils have to develop their sourcing strategy every year. Then the strategy is reviewed, collated and rationalized before the final contracts are placed. To ensure that all the commodity teams are optimized, IBM has management systems that drive the procurement teams towards similar suppliers to consolidate sourcing as much as possible. There are 6 enterprise suppliers who provide a wide range of commodities. If a commodity team is buying any specific commodity that an existing enterprise supplier has in its portfolio, then the commodity team is often forced to buy the component from that particular supplier.

The Following is the list of all services, general and production commodity councils of IBM (Table 5.2)

**IBM’s Procurement Commodity Councils (Table 5.2)**

<b>13 Services &amp; General Councils</b>		<b>19 Production Councils</b>	
1	Technical Services	1	Box/OEM & Contract Mfg.
2	Software	2	Electronic Card Assembly & Test
3	Connectivity	3	Logic- CPU
4	Telecommunications	4	Storage

5	Facilities Maintenance Services	5	Mechanicals
6	IT Equipment	6	Memory
7	Travel	7	Liquid Crystal Displays (LCD)
8	Marketing Communications	8	Power/Thermal
9	Hardware Maintenance	9	Mfg. Equipment & Build-to-Spec
10	Business Services	10	Monitors
11	Complementary Workforce	11	Logic-STD
12	Facilities Operations Services	12	Tapes
13	Media & Print Services	13	Cables & Connectors
		14	Chemicals
		15	Keyboards
		16	Wafers
		17	Actives/Optics/Passives (AOP)
		18	Panels
		19	Communications & Networking
	<i>Source: IBM</i>		

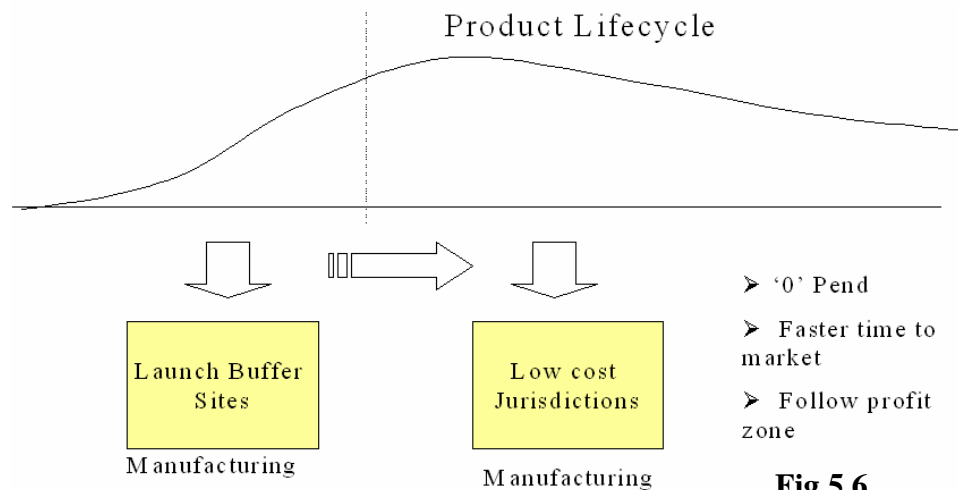
### 5.1.3 IBM's Inside Business Processes

#### 5.1.3.1 Facility and Capacity Planning

IBM is committed to the manufacturing of critical storage systems, even though it has outsourced significant portions of its commoditized manufacturing in the past few years. The reason for this commitment is firstly, to achieve a faster time-to-market than competition and secondly, to leave no customer orders unmet. IBM has its own nimble sites closer to the customer locations where it develops and manufactures new products.

These nimble sites have infinite capacity to take care of ramp-ups and sudden spikes in demand. IBM responds to such demand fluctuations through this launch buffer strategy. Absorption of such demand fluctuation is not an option for contract manufacturers who are often optimized on time and volume to keep their costs low. IBM also has geographically-based low cost manufacturing locations for manufacturing at low cost when a product's demand stabilizes. These are two completely different production models that have different purpose and management procedures (Fig 5.6).

### IBM's Manufacturing Strategy



**Fig 5.6**

The geo-based manufactured products are usually sold into the local markets. For high margin and heavy products, transportation cost drives the business case. In such cases it does not make sense for IBM to offshore production, as the savings generated from manufacturing would be eaten by the high transportation cost. This is why heavy servers

and systems are necessarily sold into the local markets whereas light systems are sometimes transported to different markets.

IBM constantly follows the profit zone to decide on which components to outsource. IBM reviews its sourcing decision on an ongoing basis and outsources components as they become commoditized and less profitable. Outsourcing contracts are usually for the complete product lifecycle. Suppliers are difficult to switch as there is a significant amount of learning and development involved when a product is outsourced.

Though IBM has been very successful in manufacturing, it faces many challenges as expressed by IBM executives. Many of these challenges are rather industry specific than IBM specific.

- 1) With the US economy getting more services focused, it is difficult to keep people engaged in manufacturing, which is increasingly being viewed as un-sexy,
- 2) With the increase in outsourcing to lower cost jurisdictions, IBM employees have to be constantly reassured and made to feel secure by explaining why their jobs must exist
- 3) Supply chain disruption due to unplanned downtimes, natural calamities and terrorist activities has to be managed in real-time
- 4) Commoditization and price pressure of computers (that include servers) constantly challenges IBM to follow the profit zone

### 5.1.3.2 Inventory Management

IBM's suppliers manage inventory close to IBM facilities. IBM shares forecasts with its suppliers and also specifies required inventory levels close to the facilities. IBM does not do manufacturing until an order is confirmed. For high margin brands, IBM keeps some of its potential sales ready at a sub-assembly level and does final assembly after it receives an order from the customer. IBM's build-to-delivery cycle time for typical orders is around 3 to 4 days.

### 5.1.3.3 Logistics

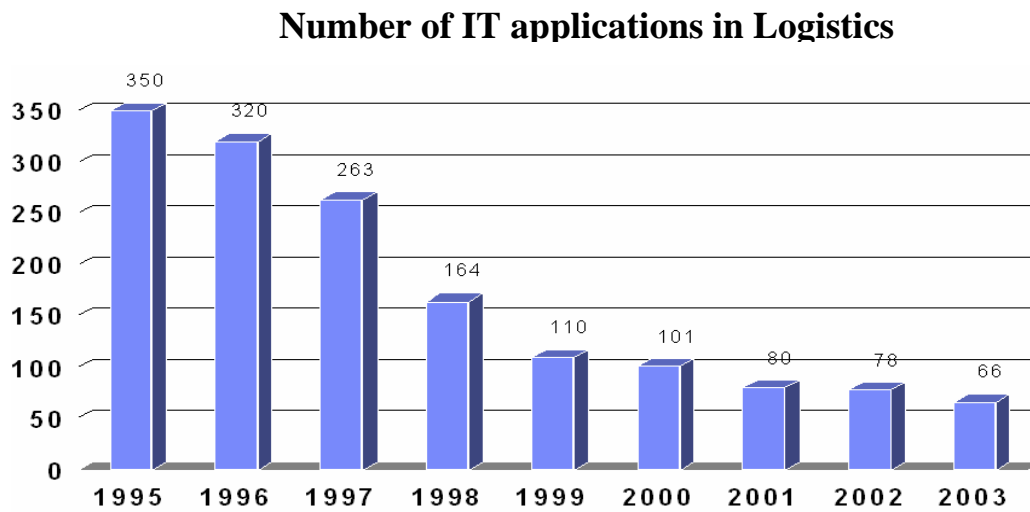
The key facts about IBM's logistics are:

- It is a \$1.5 B cost center
- It has operations in 56 countries (74 locations)
- It has operating responsibilities divided into 3 regions (Americas / Asia Pacific / Europe, Middle East, Africa)

The logistics group of IBM deals with inbound component parts logistics, outbound hardware logistics, service parts logistics, reverse logistics, OEM logistics, software logistics and services logistics. The various processes that come under the logistics function are transportation services (all modes), customs brokerage, freight forwarding / consolidation, import/export operations, shipping / receiving, packaging, warehousing, network design and optimization, logistics services outsourcing, fulfillment operations

(pick/pack/ship), deferred assembly / customization services and remanufacturing / scrapping services.

IBM's logistics organization has undergone major restructuring in the past few years. The two key themes of this transformation have been first consolidation and then the outsourcing of logistics. IBM has also deployed integrated IT systems to manage its end-to-end logistics. For example, IBM had 350 applications for managing its logistics function in 1995 (Fig 5.7). It used to create silos of information that led to poor communication and data reconciliation between its different logistics functions. Through IT consolidation IBM has reduced the total number of logistics applications to 66 in 2003.

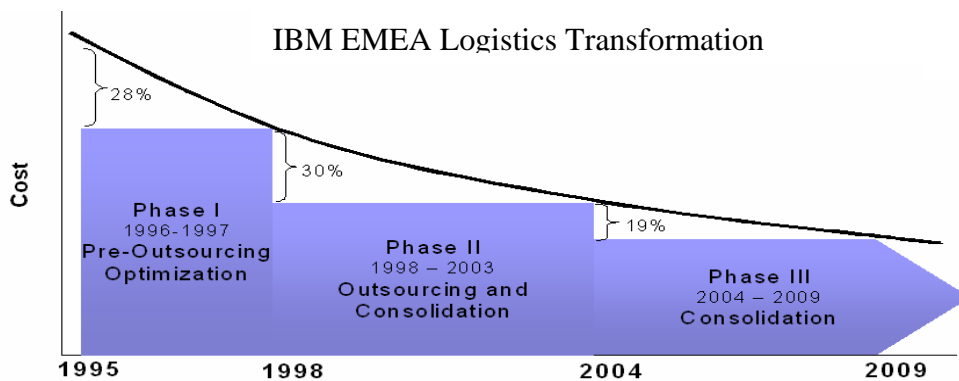


*Source: IBM*

**Fig 5.7**

### The EMEA (Europe, Middle East and Africa) Logistics Transformation

To drive centralization of the logistics function and outsourcing of non-core activities, IBM EMEA started a major transformation project in the mid-90s. The objective was to first optimize its present transportation networks, then outsource them to third party logistics providers for ownership and day-to-day management (Fig 5.8). Subsequently the plan was to consolidate logistics based on business lines to further reduce logistics costs.



Source: IBM

Fig 5.8

Until 1995 IBM's logistics was divided by region, then by country, and finally by business unit. Because of this segmentation, there was a growing need to centralize the logistics function for achieving economics of scale. To respond to this need IBM created the 'Worldwide Logistics Organization'. At this point IBM also took a strategic decision that it would outsource its logistics operation, as it does not envision being in the logistics business. But IBM also realized that to maintain its competitiveness it couldn't afford to lose control of the logistics operations.

Europe was chosen as the first geography to undergo this transformation. The first step was to regionalize geographically disparate operations by grouping small countries together as part of the pre outsourcing optimization. Subsequently IBM went for outsourcing its logistics operations. IBM started sending out large tenders at the pan-European level, that offered the sale of their assets and the transfer of their people. The strategy worked very well as at that time since ‘third party logistics’ was an evolving industry and there were many national companies who wanted to become regional players. But there was no single service provider who could take responsibility for IBM’s whole European business. With this realization IBM split its pan-European logistics function into sub-regions such as UK and Germany / Italy / Spain / France to tender it to separate service providers. Earlier to rationalization, all the intercontinental logistics were also consolidated into six main pipelines. Through consolidation IBM could increase the efficiency of its intercontinental logistics.

But this transformation wasn’t devoid of challenges for IBM. Firstly, there was a scarcity of mature service providers that could handle IBM’s business efficiently; secondly, IT infrastructure of the service providers were not developed enough to seamlessly link up with IBM’s systems. To tackle these issues, IBM actively participated in developing supplier capabilities by transferring its own employees into the supplier organizations and by sharing its IT systems. Nearly 1500 people got transitioned from IBM to their supplier organizations.



In 2004 IBM decided to segment its logistics function by business process. IBM has now only one service provider in Europe for handling the logistics of all its spare parts. Similarly, another service provider deals with PCs and servers. This transformation helped IBM to seamlessly link the customer fulfillment processes with the logistics processes.

IBM does not perform product consolidation on its own. IBM sets standards for consolidation by negotiating appropriate prices with the logistics service providers. The contracts are such designed that if the supplier does not do a good job in consolidation, they will start losing money. For warehousing, IBM does not pay a services charge for any items that remain in the warehouse for less than 5 days to foster low inventories. Because of its major drive to outsource its logistics function, IBM has been able to centralize the function, reduce expensive distribution centers, consolidate third party logistics providers, and shrink its logistics team. All these have improved its delivery cycle time, reduced cost and improved customer satisfaction.

#### **Objective Measures of this Transformation in the EMEA Region (Table 5.3)**

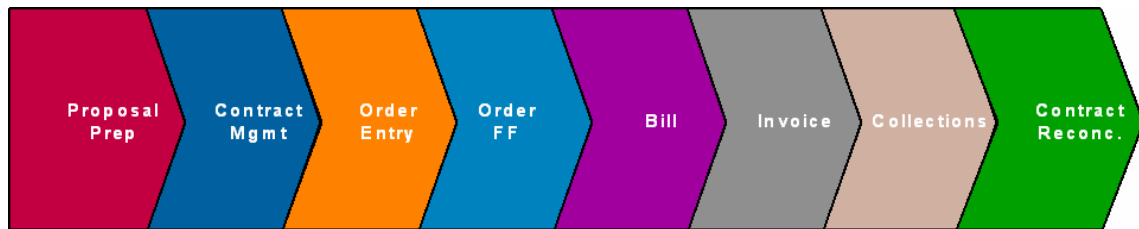
<b>Before logistics transformation</b>	<b>After logistics transformation</b>
Country/ Region platform	Geo / Global optimization
15 Owned DCs in country	All DC's were outsourced
400+ logistics suppliers	2 logistics suppliers
1700+ team members	<300 team members
Delivery cycle time: 12+ days	Delivery cycle time < 3 days

Indirect delivery model	70% + direct delivery
Cost reduction <i>Source: IBM</i>	Supply chain value and customer satisfaction

### 5.1.4 IBM's Customer-Side Business Processes

IBM's integrated customer fulfillment processes execute in a series of steps (Fig 5.9). The first step is the preparation of the proposal for sales, which is handled by the sales team. The Customer Fulfillment group supports the sales team by coordinating between various internal groups in developing the proposal. Once the proposal is developed and the sale is made, the next step is 'contract management' where the contract is validated and approved by the customer. After the contract is negotiated and accepted by the customer, an order is entered in the system. This step acts as the trigger for the rest of the supply chain to execute. Based on the order specifications, the server is manufactured and fed back to the fulfillment team for customer delivery. The fulfillment team also manages any backlog, unplanned delay and unfulfilled orders. After the system is delivered, an invoice is prepared and sent to the customer. The fulfillment team also takes care following up with the customer for payment collection / dispute resolution as required. After the customer has completed payment for the product or service, the contract is formally closed.

## Customer Fulfillment



Source: IBM

Fig 5.9

Few features of the customer fulfillment process include:

- Different pieces of the fulfillment processes interface with different groups within IBM. This end-to-end integration of the fulfillment process with ‘Sales’, ‘Logistics’, ‘Manufacturing’, and ‘Procurement’ groups make it a ‘cash-to-cash supply chain’, focused on shrinking the cash needed to support business operations.
- For hardware sales, linkage with rest of the supply chain is at the order point, for services sales; it is at the contract point.
- Customer fulfillment is linked with production scheduling using software from i2 Technologies and internal legacy software
- This generic fulfillment process applies to all customer segments, but there is a varying degree of automation depending on product and customer type. For direct sales to end consumer over the web, a majority of the process is automated in the web. For corporate sales, specific account representatives handle fulfillment, who are either IBM employees or outsourced service providers.
- The fulfillment processes for different business groups such as hardware, software and global services are centralized under the same umbrella. This helps

IBM to minimize replication and leverage on centralized IT capability. In the past this was replicated in different geographies for different business groups.

- Customer fulfillment for IBM has transformed from a ‘low value transaction’ oriented process to a high ‘value sales support team’ oriented process.
- The relationship with the customer is not only a sales relationship; it is increasingly an end-to-end supply chain relationship. This approach has helped IBM to increase customer satisfaction.

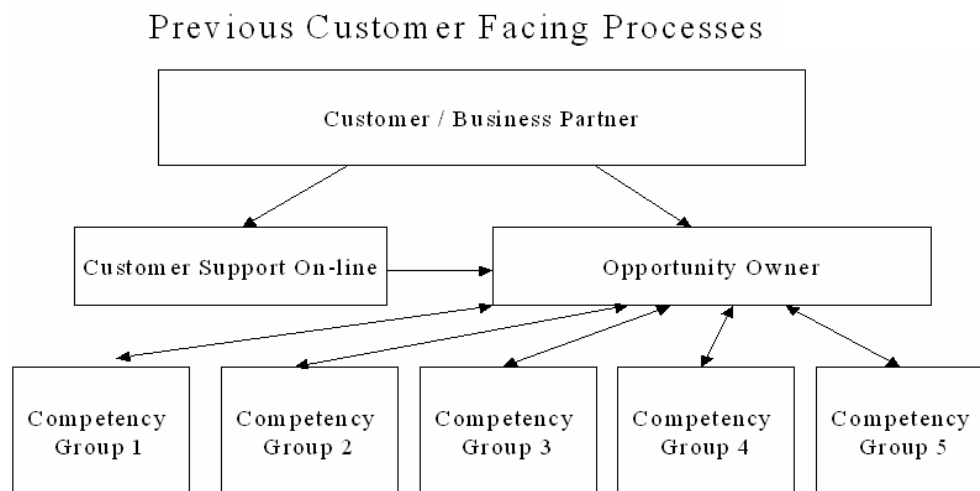
There are several benefits of having a well-integrated fulfillment process with the rest of the supply chain. Firstly, it enables efficient cash management. Secondly, productivity of sales team increases greatly as it no longer remains the single point of contact for all kinds of customer issues such as issue resolution, expediting, billing, invoicing and collection, but focuses in getting more business. All the customer support and administrative activities gets separated from the sales activities.

IBM has gone through a major transformation in reorganizing its customer fulfillment function. Earlier when IBM used to sell hardware, software and services separately to its customers it made sense for each of the business units to have separate links to the customer. But as IBM has evolved from selling computer components to providing integrated solutions, there has been an increasing need to show a single face to the customer. IBM made a strategic decision to internalize all the different fulfillment functions to facilitate one stop shopping for the customer. The primarily objective of this

transformation was to increase sales support and to reduce cost by consolidation. These objectives were achieved through the following steps

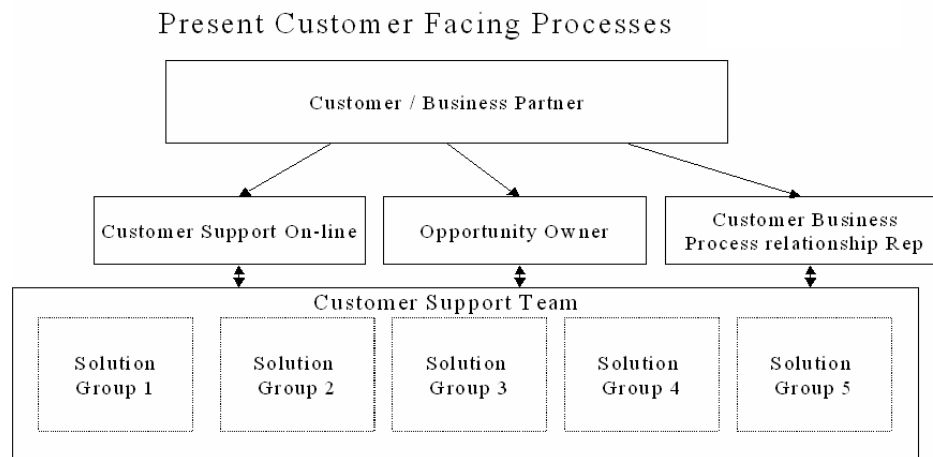
- A) Eliminate unnecessary or redundant processes and linkages
- B) Automate to increase efficiency
- C) Consolidate to achieve economics of scale
- D) Move low customer touch processes to low cost jurisdictions

Previously only the opportunity owner from the sales team used to communicate with the customer / business partner on behalf of IBM. Customers also had the option of placing order online though the Customer Self-support Online (CSOL) website. But all requests entered online in CSOL finally came to the sales representative to act upon. In this scenario the opportunity owner/sales representative had to maintain multiple channels of communication with the different internal groups within IBM (Fig 5.10). This kind of coordination activities used to take up a lot of the time of the sales personnel. This also restricted the opportunity owner from going after multiple opportunities, as he/she had to stick with a single client to take care of all their requirements.



**Fig 5.10**

Recognizing the inherent inefficiency in such a design, IBM transformed its fulfillment function by creating a customer fulfillment team. This team is now responsible for coordinating between all internal groups and competency centers for solution design and delivery. This team also provides support to the opportunity owner who no longer has to worry about order fulfillment and day-to-day customer issues resolution. The Customer Support Online-website is also being completely supported by the customer fulfillment team. A new position called ‘Customer/Business Process Relationship Representative’ takes care of all operational issues with the customer. All these have freed up the sales force to go after new business for IBM.

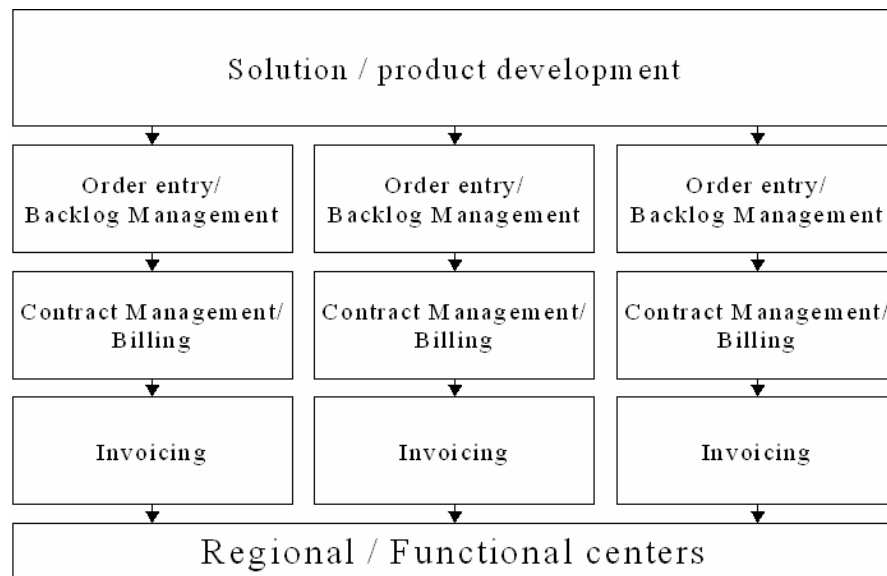


**Fig 5.11**

The low-touch administrative functions such as order processing, contract management and invoicing was previously replicated in each individual business line and geography (Fig 5.12). For example, the hardware, software, IT enabled services, and consulting business had separate administration for these sales support services.

CSOL is a combination of web, telephone and subject matter experts for Small and Medium businesses. This also frees up valuable sales time. For example, IBM was encountering lot of queries from customers about invoice format or the invoice being sent to a wrong department. With this new initiative customers could go online to access their invoices. Also, they could download invoice information in whatever format they wanted to ensure compatibility with their own in-house systems. More and more self service led to: 1) low cost and 2) increased customers satisfaction via more visibility e.g. Inventory Online (what customers have in terms of inventory with IBM), Contract online, order status online, what are the terms of finance etc

**Previous Low Touch Fulfillment Processes**



**Fig 5.12**

IBM restructured such backend services by consolidating them into support centers located in low cost jurisdictions. Now IBM has seven such competency centers that cater to all business lines. These competency centers handle customer records, hardware order

entry, distributed software, service suite, billing/invoicing, billing adjustments and purchase orders. These competency centers centralize all administrative functions of a specific type irrespective of geographic location.

## 5.2 Dell Personal Computer Supply Chain

### 5.2.1 Dell's Supply Side Business Processes

#### 5.2.1.1 Procurement Organization

The procurement organization of Dell is centralized and led by two senior VPs and a chief procurement officer. The entire organization employs over 700 procurement professionals. The strategic commodity group is responsible for bulk of the procurement.

##### 5.2.1.1.1 Commodity Team

There are three levels in the commodity team.

**Level 1: Business Strategy Team (BST):** BST is a cross-functional strategy team led by major business directors including the procurement director, marketing director, production director, new product development director and directors from other Dell business groups. The team is responsible for developing a three-year strategy for procurement. Some of the areas this group looks after are

- The path of computer technology development
- Strategic alignment of Dell with its business partners
- The major investment initiatives



**Level 2: Strategic Commodity Team (SCT):** The SCT is represented by Senior managers of different groups. Structurally SCT is similar to the BST. The main role of the team is to develop an executable plan for the strategy developed by the BST.

**Level 3: Global Supply Team (GST):** The GST is represented by on-the-ground procurement professionals that look after the daily operations of procurement such as order booking, chasing suppliers for delivery of orders as well as making sure that supply-demand is synchronized. Global Supply Managers make sure that there is sufficient capacity at the supplier locations to meet demand. They also act as the first line of defense in case there are any supply disruptions. The majority of GST is based close to the supplier locations, which are often outside the US. The supply quality engineers ensure that the suppliers abide by Dell's quality standards.

The key philosophies of the procurement group are

- A. Work with only a few selected suppliers. For Dell, the top 20 suppliers comprise of 75% of total dollar value of procurement. The rational for having very few suppliers are
- Strict quality requirements could only be managed by dealing with few suppliers
  - Once a supplier is developed, it is of both parties interest to develop as much a deep relationship as possible.

- B. Dell believes in maintaining deep relationships with its suppliers. Relationships are usually managed at a very high level. Minimum only once a year a CEO-CEO meeting is organized.
- C. Dell rewards suppliers on clearly defined goals and objectives including
- Technology (time to market new technology)
  - Quality (reliability, defects rate)
  - Cost (cost take downs)
  - Service (SLC inventory level)
  - Continuity of supply

The supplier performance is monitored through a Quarterly Business Review process. The objectives are set in the beginning of each year. Objectives are defined as specific measurements for each of the five categories above. Supplier performance is objectively measured on a quarterly basis against the defined objectives for that year.

### 5.2.1.2 Inventory Management

Sales does a yearly forecast that is updated a couple of times during the quarter. Then the forecast is sent to the 'Demand - Supply' team. This team breaks the forecast into a bill of materials of individual parts and sub-systems. Then they take a qualitative judgment about the feasibility of meeting the demand. After making the required adjustments it becomes a material requirement plan (MRP). The MRP is then sent to the procurement team to ensure availability of materials. The forecasted MPR is also shared with the suppliers in advance to facilitate their planning. Dell's suppliers maintain inventory close to Dell facilities that are called Supplier Logistics Centers (SLCs). Day-to-day

consumption from the SLCs are also sent to the suppliers thirteen weeks in advance to give them a better sense of the market.

The MRP is updated on a daily basis as demand information becomes clearer. The suppliers can also monitor daily inventory level at the SLCs so that they can plan accordingly. Dell specifies an inventory level (currently 10 days of supply) at the SLCs that the suppliers have to maintain at any point of time. If there is oversupply (forecast was too high), Dell may also cancel some of the orders. Cancellation is based on the type of product that is being considered. For example, if it is a standard industry part that the supplier can sell elsewhere, Dell can cancel such consignments. On the other hand, if the components are specially tailored for Dell, such consignments are usually not cancelled.

In many cases Dell directly deals with Tier 2 suppliers. The main objective of Dell in doing so is to ensure continuity of supply and reduce procurement costs further. Dell negotiates on behalf of its tier-1 suppliers to aggregate volume and leverage its own buying power.

Shortages are usually identified on a three weeks time horizon. If there is any shortage, demand is shaped by increasing price or by giving an upgrade to steer customers away from short-supplied components. Artificially increasing the lead-time of order placement to delivery is another method for shaping demand. For example, in case of a shortage the lead-time for shipment of that particular product is increased, which automatically steers customers to other options.

Demand is shaped not only based on inventory levels at the Dell facilities and SLCs, but also based on inventory in-transit and in supplier locations. Dell maintains complete visibility of inventory in the inbound transportation network, as well as in supplier locations several tiers down the chain. Dell is also starting an initiative by which when it places a new order, it would not specify the location (facility) to which the supplier has to ship the order. The destination decision would be made only in the last week of delivery when the shipment hits Long Beach, California. This will give Dell immense flexibility to route components to its different facilities based on real time demand information.

Dell organizes several meetings for managing its production of inventory such as the daily production meeting, weekly outlook meeting and shortage meeting. In the daily production meeting the previous day's demand and fulfillment (by product and plant) is discussed first, and then any shortfall that has happened in the previous day is planned for in the next 24 hours. Then the production schedule for the next day is planned and committed. Apart from these regular meetings, every Wednesday a weekly outlook meeting is conducted where any overtime requirements and backlog are planned. In case there is long-term shortage of any specific part item, a shortage meeting is called to identify contingencies.

The Supply Demand team does the balancing act between demand and supply. The plans are updated regularly. Dell uses a tool with all the rules built in for production planning.

Every three hours as orders come in, the rules are changed based on constraints. For example, if a plant gets in trouble orders are moved to a different plant.

### 5.2.1.3 Inbound logistics

Because Dell maintains limited inventory in the Supplier Logistics Centers (SLCs), Dell has to ensure that the inbound transportation network is highly efficient to respond to fluctuations of demand. Dell has set up a network of ocean and air carriers for its suppliers to use. This ensures Dell has control over the inbound logistics for which it does not pay for directly. Dell has also optimized the inbound transportation network to take care of any kind of supply disruptions. Third party service providers manage the SLCs. Dell designs the service contract ensuring that it seamlessly supports Dell's production requirements. The SLC service providers are paid on a per transaction basis by Dell's suppliers.

## 5.2.2 Dell's Inside Business Processes

### 5.2.2.1 Operations Planning

The operational planning is done in the 'operations cell' that manages the plant operations centrally. The plants do not have any production control in-house. Through centralization, Dell has minimized replication of task. This also helps Dell to perform system wide optimization on efficiency and flexibility. The role of the operations cell is two fold: firstly, to do long term strategic planning and secondly, perform daily execution and troubleshooting. A long-term operations plan is laid out for a three year time horizon.

Execution planning is done in four consecutive time horizons, 'one month horizon', 'two weeks horizon', 'three days horizon' and 'daily production planning'. Each planning window has tailored tasks and procedures. For example, the one-month planning is based on the supply-demand forecast for the next one month. Its main objective is to plan and allocate capacity to meet the forecasted demand. The two-weeks planning especially looks at possible parts and manpower shortages and does contingency planning. Overtime requirements are planned in three-day planning windows. During the 24 hours planning window daily production runs are committed.

Dell has several teams within the operations cell to look after different activities. The 'long term loading team' looks after long term capacity and headcount plan by products. The 'strategic material team' does the two-week planning to ensure availability of materials. The 'production control' team does planning for the every 24 hours.

Plants managers are measured on plant productivity, cost per box, safety and quality parameters. In terms of manpower, nearly 30% - 40% of all the workers are temporary. This gives Dell the required flexibility to match with fluctuating demand as and when required.

### 5.2.2.2 Manufacturing

Production schedules are created based on demand information. The schedule is then sent to the production line as well as to the supplier logistics centers (SLCs). The SLCs then commit inventory based on availability and production schedule. A shuttle then arrives at the SCL and picks up inventory for the next two hours of production. Then the production takes places, which is then packed and shipped to the customer.

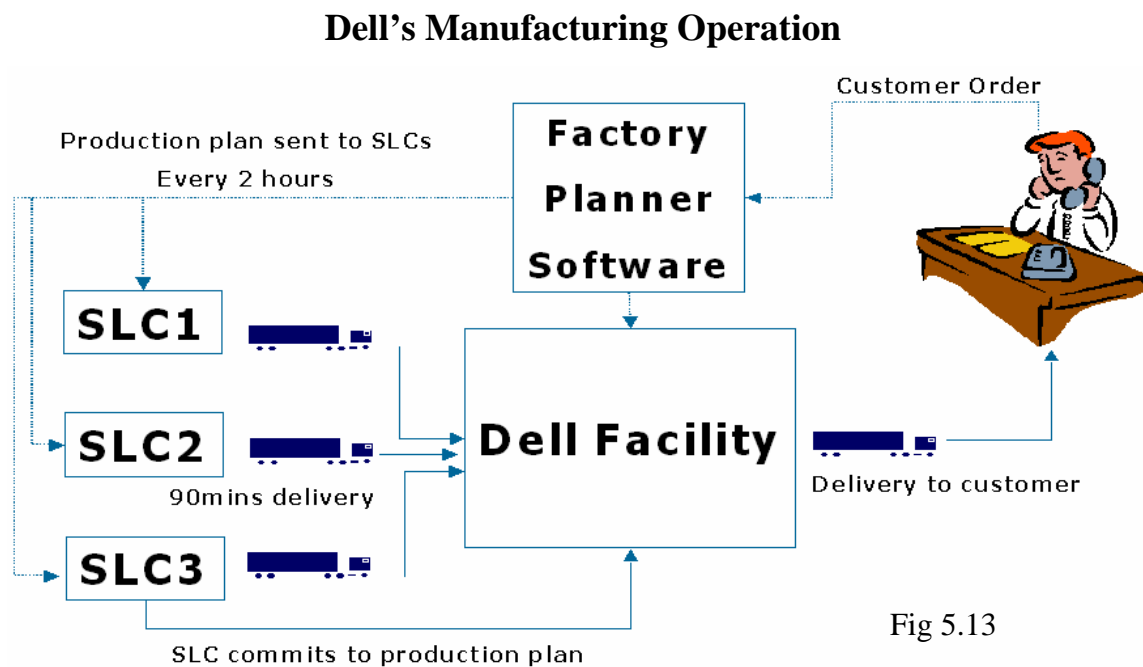


Fig 5.13

Details of the production process are (Fig 5.13):

1. Customer places order over the Internet, e.g. using a credit card
2. The financial transaction takes less than 10 minutes to complete, after which it is sent to the plant

3. The order is then sent to the Factory Planner Software System. The factory planner schedules the order to the appropriate plant every two hours. The planner then looks at the present raw material inventory level inside the plant and inside the SLCs. If the raw material is not available at the factory, an order is placed to the appropriate SLC carrying inventory. If for some reason the parts are not available, the order is held back for the next production run and raw materials are expedited.
4. A third party runs the SLC on behalf of the supplier. The service provider is paid on a per transaction basis by the vendor. It is the vendor's responsibility to have material at the SLC. Dell also sets up the framework of the contract for the SLC service provider. The ordered material needs to be delivered at the Dell facility within 90 minutes of order placement.
5. The operations center located inside the plant schedules the trucks and assigns them to particular doors for delivery.
6. Once the materials are in place for production, orders are broken into individual computers if it consists of multiple computers. But the individual computers would be tracked as part of a single order throughout the process to be able to collate them at the end. Every computer is assigned a chassis that travels on the production line. First it goes to the kitting station where the individual components are pulled out from the inventory based on the customer's order. To facilitate this process, the software system displays what parts goes in which order. Then all the chassis, coming from different kitting lines, are married together for the build station where they are assembled. After the computers are



built, they are put back into the line for automatic testing and software installation. All these activities are automated as each machine is provided with a specific ID that is matched with the ordering details. Once the testing is complete, the computers move for boxing. This is where rest of the accessories such as keyboard and monitor as ordered by the customer are included and packaged together. The boxes are then sealed and sent to shipping location where labels are put on. The boxes are then stored in an automated warehousing facility where all the orders are aggregated (if an order has multiple computers) before shipment so that they reach the customer at the same time.

### 5.2.3 Dell's Customer Side Business Processes

#### 5.2.3.1 Channels for Order Booking

Dell has primarily two channels of order booking. These are the web based transactional channels and the sales force driven relationship channel. The transaction channel represents mainly online procurement of desktops and laptops by individual users. The relationship channel represents usually bulk orders from the government, educational institution and businesses. Dell has a specially customized website for its business and institutional customers. Some companies have negotiated catalogue-based purchase and special discounts where their employees go online and use the catalogue to make purchases. In spite of having these multiple channels, the majority of the relationship business orders come from the sales team. There are also different kinds of ongoing promotions that act as a significant conduit for sales. Dell has also opened nearly 100 kiosks around US where customers can walk in to chose Dell machines and place orders.

### 5.2.3.2 After Market Operations

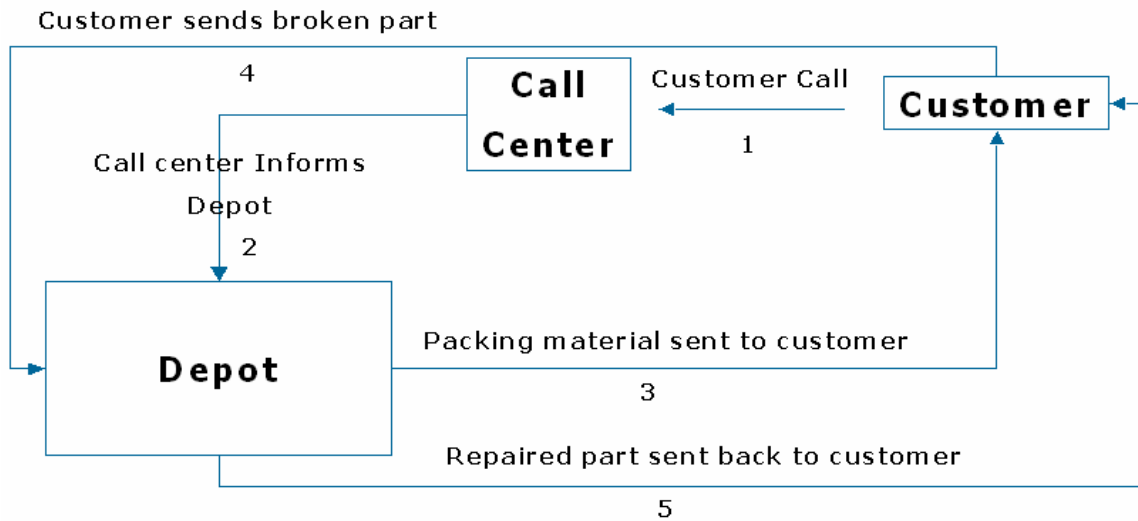
Dell’s aftermarket objective is to service its customers consistently on time. There are three main categories of aftermarket service that Dell offers to its customers.

1. Return to depot operation (represents less than 10% of cases)
2. Next business day onsite repair (represents 90% of cases)
3. Four hour rapid repair (remaining cases)

#### 5.2.3.2.1 Return to Depot Operation

Dell customers have the option of returning any part back to Dell if it fails within warranty period. Dell has a depot operation in Memphis to cater to its US customers.

#### Dell’s Return to Depot (After market) Operation



**Fig 5.14**

**Process flow for return to depot operation is as follows (Fig 3.14):**

- A. Customer calls the call center

- B. Call is processed, validity checked, and information is sent to the depot
- C. Depot dispatches the packing material the next day to the customer
- D. Customer packs a broken part into the pack and sends back to the Depot
- E. Depot gets the defective part in the morning, repairs it during the day and ships it out back to the customer by night

The supplier or third party appointed by the supplier repairs the parts. But Dell actively manages the operations to make sure that the parts are repaired on time and returned to the customer.

#### 5.2.3.2.2 Next Business Day Operation

If an eligible customer for this service category calls by 5:00 pm local time to report any problem, Dell is committed to service that customer by the next business day. Dell maintains a fill rate for this kind of service of over 99%. To achieve this fill rate, Dell has successfully mirrored some of the successes from the manufacturing side to the services side. Similar to manufacturing, the supplier is responsible for maintaining service parts at the Supplier Logistics Center, which is located close to the shipping center. Dell has negotiated warranty contracts with suppliers, similar to what it offers to its customers. For the higher value items (e.g. flat panel monitors), the repair center is integrated with the fulfillment center. The supplier usually runs the repair center. The reason for having a repair center is because Dell wants to minimize new parts procurement. For relatively lower value items, Dell has warranty contracts with suppliers who take care of returned parts. The fulfillment center generally has 5 days of supply whereas the SLCs have 30 days of supply.

### Dell's Next Business Day Operation (After Sales)

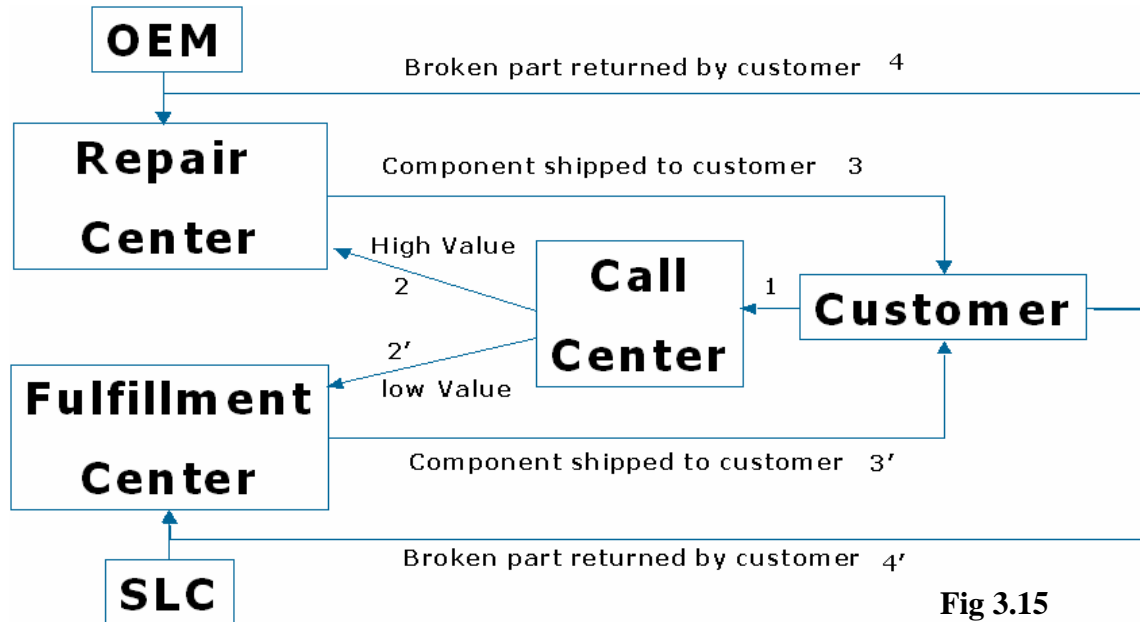


Fig 3.15

The process flow for next business day operation is as follows (Fig 3.15)

- A. Customer calls up the call center to report hardware issues.
- B. The tech support team analyzes the problem and arranges a time and date for repair.
- C. The information is then sent to the fulfillment center that manages both the service parts and the field technician teams.
- D. If the customer places his/her complaint by 5:00 PM local time, the replacement part is shipped for the next day delivery from the fulfillment center. There is a standard metric that measures what percent of orders that were shipped by the next day. In case there is any delay, there are metrics that measure if the delay was because of a fulfillment /warehouse issue.
- E. If it is a customer replaceable unit (50% cases), then the material is shipped directly to the customer. Otherwise, it is shipped to the field technician. The field

technician either picks up the material from the airport or gets it shipped directly to him/her.

- F. The field technician visits the customer site if onsite help is required and then returns the defective part to the fulfillment center. For customer replaceable parts, which represent nearly 50% of the cases, the customer himself/herself has to return the broken part.

#### 5.2.3.2.3 Four-Hour Replacement Operation

Dell's four-hour replacement operation mainly caters to its business customers. There are about 100 "four-hour parts stock locations" located all around the US where replacement inventories are stored. Dell keeps track of customer sales and related services contracts to estimate the required inventory level at these stock locations. The economic feasibility of opening a new inventory location is also dependent on the sales information. The probability of failure of different parts and their criticality is also considered for inventory planning.

**Process flow for the four-hour replacement operation is as follows (Fig 3.16):**

- A. Customer eligible for 'four-hour service' calls up and reports problem at the call center
- B. The availability of the required part is checked at the closest 'four-hour stock location'. If stock not available, the closest stocking location is searched where inventory is available
- C. The component is shipped from the stocking location directly to the customer. A Dell representative also attends the customer if required.

- D. The enterprise command center monitors the movement of these parts / stock outs etc on a real time basis. Inventory is shipped from the central fulfillment center as well as among the various stocking locations based on requirements.

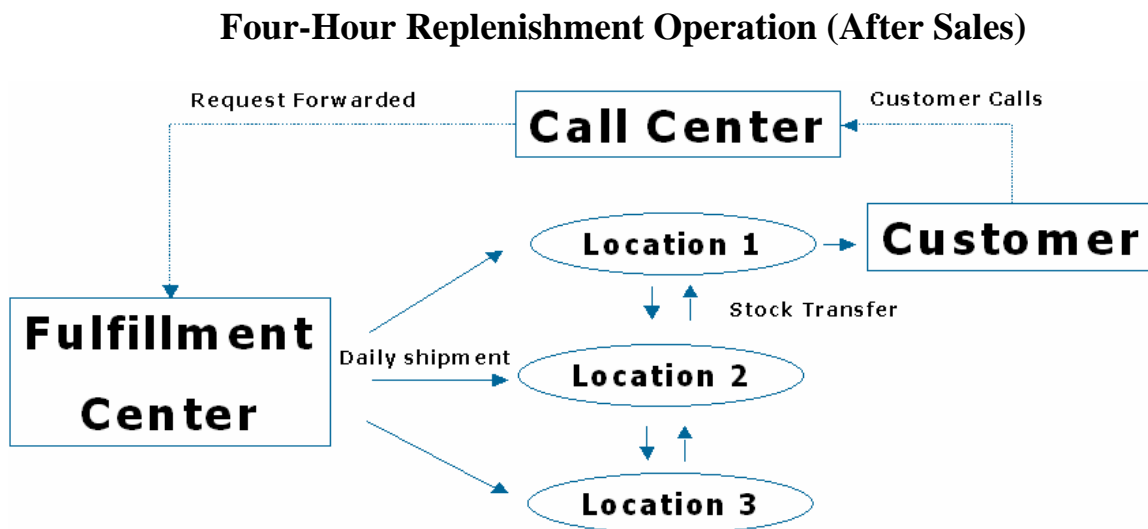


Fig 3.16

#### 5.2.3.2.4 New Installations

Dell offers installation services for its customers. If a customer chooses to avail installation service, Dell sends a field technician to the customer premise after the computer is sent to the customer. The technician arranges a time with the customer before visiting the premise.

#### 5.2.3.2.5 Recycling

Recycling of computers after its life is over has become an important issue for the computer industry. The green laws in Europe have enforced recycling operations

mandatory for electronic manufacturers. In the US too various states are also coming up with recycling legislations.

#### 5.2.3.2.5 Outbound Logistics

In terms of delivery of computers, Dell offers different service levels to its customers. The customers have the option of choosing a service level. The prices are also associated with the service level that the customer chooses and not with the mode of shipping. There are four-service levels that Dell offers to the customer. The service level (days of delivery) is measured after the product has been manufactured.

1. Next business day delivery
2. Second business day delivery
3. Third business day delivery
4. 3-5 business days of delivery

The challenge for Dell is to ensure that the products are routed correctly at the lowest cost. Dell takes care of this problem by optimizing its transportation network. Dell also makes sure that delivery is fast enough so that its customers are not propelled towards going to a superstore for buying the product. There are four basic categories of transportation modes that Dell uses for outbound logistics.

1. Ground parcel delivery (3-5 days)
2. Parcel air (next day delivery)
3. LTL ground (3-5 days)
4. Heavy weight air(3 days)

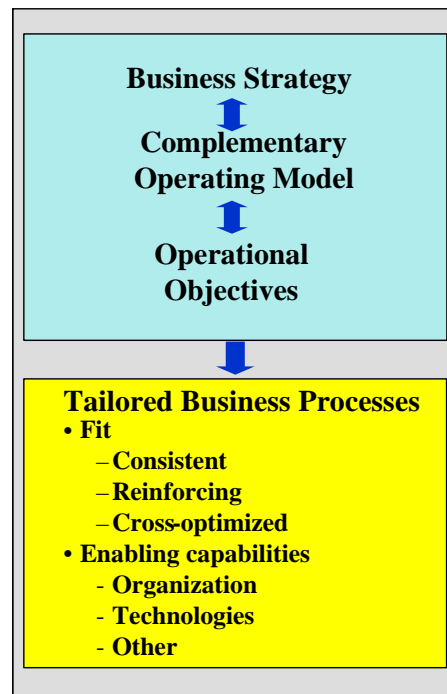
The entire country (US) is served from five fulfillment centers. Dell groups the customers by zip code clusters or zones. In the US market, Dell sells roughly 75% of its products in the eastern and central US and the remaining in the western US. Dell is involved in several packaging initiatives to ensure that the packages are optimized in terms of size. The computers are grouped together in large containers when shipped from offshore locations to save shipping space. Dell is also trying to reduce packaging material to minimize environmental impact of waste. Dell also uses alternative delivery modes such as delivery through the local Fedex store or Kinkos. The customer would be informed when the shipment arrives at these locations so that he / she can drive down to pick up his / her order.



## 6 The Supply Chain Framework

The research framework shown in Figure 6.1 used for analyzing the strategic fit of the chosen supply chains with their corresponding business strategies. Firstly, the company strategy is explicitly identified, secondly, the alignment of the operating model with its business strategy is analyzed and thirdly, the operational objectives of the company such as higher customer satisfaction, efficiency and asset utilization are judged in the context of its operating model. Finally, the tailored business processes that are unique to its operating model are discussed.

### Supply Chain Excellence Research Framework



**Fig 6.1**

*Source: Supply Chain 2020 Project*

## 6.1 IBM's Supply Chain Framework

### 6.1.1 IBM's Business strategy

IBM's business strategy is to be a 'diversified and value added provider of networked technology solutions to businesses around the world'.

IBM's choice of products and solutions that it offers to its clients are often not based on IBM's own business interests but rather on its customer's business need. This is why IBM often partners with other product and service providers to offer complete business solutions. IBM's diversified strategy goes hand in hand with its strategy of providing high touch services to its clients. Unlike many of its competitors, IBM starts its client interaction with firstly identifying the business problem and then designing technology solutions around it.

### 6.1.2 IBM's Operating Model

IBM's operating model is focused towards providing a single face to its customers, extensive pre-sales and post-sales support, and custom tailored build-to-order manufacturing of its servers and systems.

#### 6.1.2.1 Single Face to Customer

IBM's 'single face to customer' operating model reinforces its diversified product portfolio and high-touch customer services strategy. IBM has created a Customer Fulfillment team that coordinates between all other internal business groups within IBM to show a single face to its customers. This centralized coordination also helps IBM in

executing complex orders with hardware, software and services bundled together. For example, if a customer requests a server with a specific software and a services contract, he/she only needs to be in touch with the customer fulfillment team for the entire order rather than maintaining multiple channels of communication with IBM's hardware, software and services business units. The customer fulfillment team in turn works with the hardware, software and the services groups within IBM to ensure seamless execution of the customer order.

#### 6.1.2.2 Extensive Pre-Sales and Post-Sales Service

IBM provides extensive services to its customers through its dedicated sales team, customer fulfillment team and online website. IBM's sales team maintains constant communication with the customers for identifying their business needs and proposing tailored solutions by bringing together both IBM's internal capability and IBM partners' expertise. IBM's customer fulfillment team supports the sales team or the customers for all supply chain related issues such as ensuring on time product delivery as well as for all low touch day-to-day activities such as order booking, contract management, invoicing. The customer Self-Support Online (CSOL) website is also a rich source of information for IBM's customers. IBM provides extensive post sales support to the customers using its large field force, global consultants and outsourcing services.

#### 6.1.2.2 Build-to-Order Manufacturing

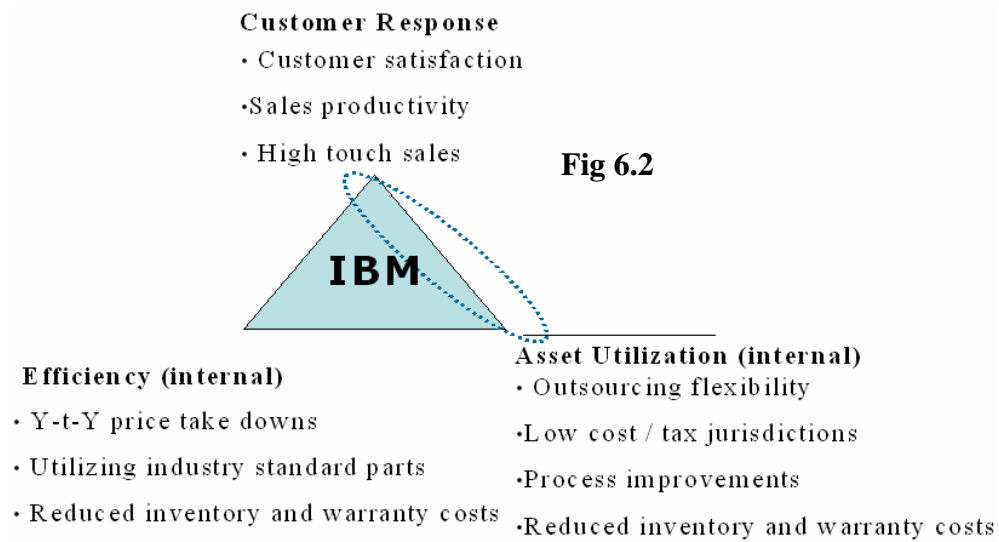
IBM's build-to-order manufacturing model supports its diversified product portfolio and tailored solution delivery strategy. IBM produces server and storage products only after

its gets a customer order. This gives IBM the required flexibility to build the systems based on exact customer specifications rather than following a 'one size fits all' strategy. The build-to-order model also helps IBM to stay abreast of the latest technology developments and provide cutting-edge solutions to its customers. To support its build-to-order model, IBM procures materials just-in-time from its suppliers through vendor managed inventory at its manufacturing locations. IBM also maintains launch-buffer manufacturing locations for manufacturing and introducing new products faster than its competition. Both these processes support IBM's build-to-order manufacturing model.

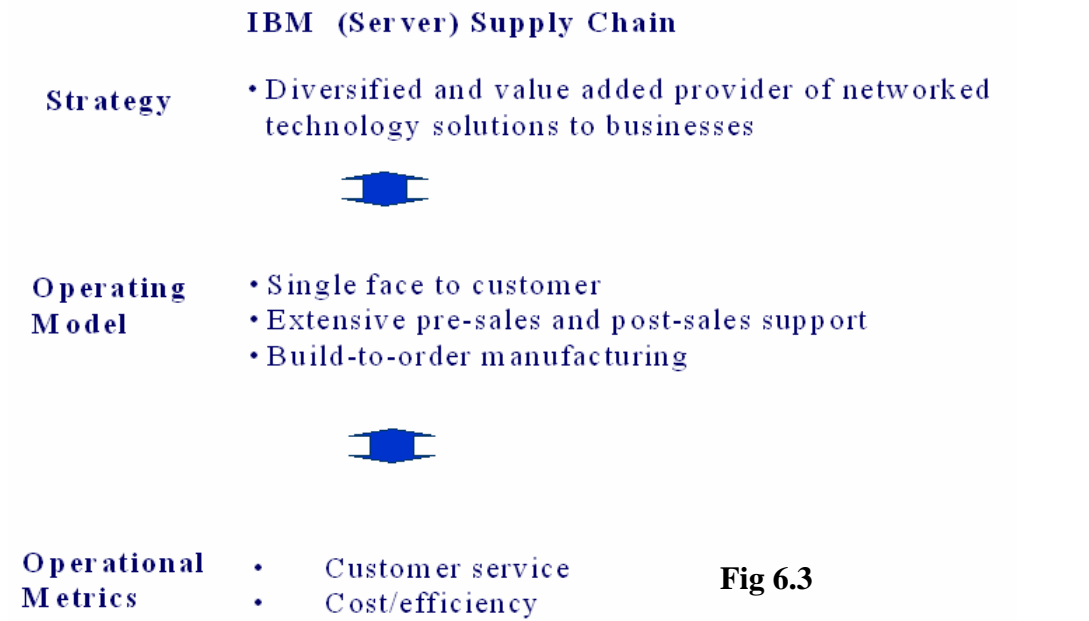
### 6.1.3 IBM's Operational Objectives

IBM's operational objectives are primarily to increase customer satisfaction and asset utilization. To increase customer satisfaction IBM offers a diversified product portfolio, and value added and high touch service to its customers. To increase asset utilization IBM has outsourced non-core and low profitable activities (Fig 6.2). IBM's ISC has specific measurements of customer satisfaction and sales force productivity. The measures of asset utilization are outsourcing flexibility, low cost / tax jurisdictions, process improvements / leveraging fixed capacity, and reduced inventory and warranty costs. The measures of efficiency include year-on-year price takedowns that exceed the industry, cost efficiency / avoidance actions, utilizing industry standard parts versus proprietary designs, and commonality across system platforms.

### IBM's Operational Objectives



The following figure (Fig 6.3) shows how IBM's business strategy is supported by its operating model and operational objectives.



## 6.1.4 IBM's Tailored Business Processes

IBM's customer fulfillment, launch-buffer manufacturing, centralized procurement and efficient logistics processes are some of its tailored business processes that support its operating model and objectives.

### 6.1.4.1 Customer Fulfillment

IBM's customer fulfillment process reinforces its high touch customer services strategy. Firstly, the fulfillment processes support IBM's sales team by taking ownership of the day-to-day operational and administrative activities with the client. This helps the opportunity owners (sales team) to spend his/her time in high value added activities such as understanding a customer's business problems and designing tailored IT solutions.

The customer fulfillment function coordinates between the various internal groups within IBM, which helps in faster turn around for customer requests, proposal development and solution delivery. This tailored business process supports IBM's diversified business strategy by bringing together different internal groups and by aligning them with a unified strategy. The Customer Self Service Online (CSOL) website enables the customers to take care of standard administrative needs themselves, such as timely access to invoices, query on order status, questions on services contracts etc. CSOL thus helps in minimizing routine interaction of the customer with the sale team. This in turn increases customer satisfaction as they now get real time assistance and access to information. COSL also provides information to the customer in different electronic formats, thus

enabling them to directly link up with IBM's sales systems. The customer/business partner relation representation complements the CSOL in providing fulfillment support to different customers for services that are not covered under the COSL.

The competency centers in low cost jurisdictions helps IBM to reduce administrative cost and increase service level. The cost savings is eventually passed on to the customers, which helps in improving customer satisfaction. Single sourcing of administrative services also reduces complications arising from diversified products and services offerings.

#### 6.1.4.2 Launch-buffer Manufacturing

IBM's launch buffer manufacturing sites are critical to its faster time to market of new products. Using the launch-buffer practice IBM makes sure that it leaves no customer unserved. These sites are manufacturing locations geographically close to the markets they serve. They are used both as research & development bases and as quick ramp-up locations once the product hits the market. As the product matures and its demand stabilizes, IBM off-shores the manufacturing operation to low cost jurisdictions. These launch-buffer sites have infinite capacity, meaning that these sites are designed to scale up productions if there is a sudden spike in demand and again scale back when there is a dip.

#### 6.1.4.3 Centralized Procurement

IBM's procurement function is centralized, which is tailored to support its diversified customer strategy. The thirteen services and general council teams and 19 commodity

teams ensure that each procurement category, which are quite different from one another, are separately looked into for sourcing decisions and reconciled at the end. This helps IBM to procure components and systems for its diversified product portfolio efficiently. IBM procures the bulk of its input components from only a few selected core and regional niche suppliers. Because of this approach IBM can ensure complete process and IT integration with these few carefully selected suppliers.

There are over 700 specialized engineers in the procurement team who actively takes part in the product design and parts standardization to minimize procurement cost. These procurement engineers, although working as part of the procurement team, are fully integrated with the product development processes within IBM. This helps IBM to reduce its procurement cost base using more standardized parts across multiple platforms.

#### 6.1.4.4 Logistics

IBM has consolidated and outsourced its logistics function to third party service providers. Since IBM is not in the logistics business and logistics is a big overhead for its business, it outsources to specialized service providers in alignment with IBM's high service business strategy. IBM has also aligned the logistics functions with its business functions. For example, in Europe IBM has outsourced all the returns management to a single service provider. Similarly, for the rest of business it has outsourced to another service provider. This strategy of aligning logistics with specific business processes has helped the logistics service providers focus their efforts and maintain high service delivery standards.



## 6.2 Dell's Supply Chain Framework

### 6.2.1 Dell's Business Strategy

Dell's business strategy is to be the 'highest value to price provider of computers and accessories to price conscious customers'. This business strategy has been deeply ingrained in Dell's culture so much as it has become its corporate identity in some sense.

If we start our analysis from the business strategy, firstly, 'value' in the 'value to price' equation can be reasonably equated to the intrinsic value of the product as realized by its customer. In an increasingly standardized computer market, Dell, as well as its competitors, are aware that such 'value' can hardly be differentiated in the mind of a consumer. For example, two PCs with exactly the same configuration but of different brands may be of similar value to a customer if all other parameters remain the same. This analysis highlights the importance of 'cost' in maximizing the 'value to cost' equation of Dell's strategy. Dell's operating model is thus clearly focused towards minimizing total cost. Dell has achieved this through its uniquely designed operating model.

### 6.2.2 Dell's Operating Model

Dell's operating model is focused towards direct sales to customers using phone and web, build-to-order manufacturing of standardized computers and box level services to its customers. Through its operating model Dell supports its strategy of being the highest value-price provider of computers.

### 6.2.2.1 Direct Sales to Customers

Dell's direct sales to customer process through web & phone as highlighted in Chapter 5 supports its business strategy. Through direct sales, Dell saves on retail markups, inventory carrying costs and related management overhead expenses. These cost saving are passed on to Dell's consumers as reduced PC prices. The direct model also helps Dell to increase efficiency in booking and processing of customer orders as most of the processes are automated online. Because of direct sales to customers, Dell gets a real time sense of demand information to optimize the rest of its supply chain. This greatly contributes towards further reducing operational costs and order to delivery lead-time.

### 6.2.2.2 Build-to-Order Manufacturing

Dell manufactures a computer only after it receive an order from a customer. Dell's build to order manufacturing not only saves inventory carrying and inventory obsolescence cost, but also helps in customizing each computer it makes. As discussed Chapter 5, Dell does not hold component inventory in the manufacturing plant more that 2 hours at a time. Similarly, Dell holds only 2 hours of finished goods inventory after they are manufactured. Dell's box level system testing, which is integrated with the build-to-order manufacturing process also helps in further reducing inventory.

The build-to-order manufacturing policy has also helped Dell to achieve negative cash-to-cash cycle time. This means Dell makes payments to its suppliers much later than it

collects its receivables from its customers. This helps Dell to save on high interest costs for borrowed money.

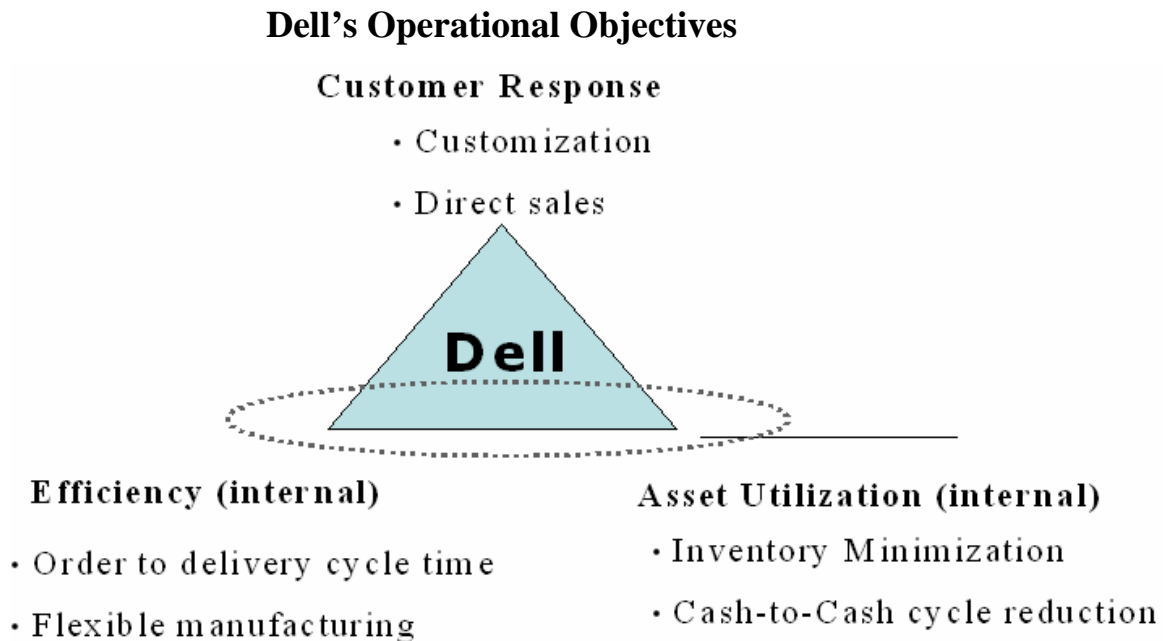
### 6.2.2.3 Box-level Service

Dell provides cost efficient and quick-turn around services to its customers that are only related to the usability of their hardware products. Dell restricts itself into offering only box level services such as installation help, returns management and hardware repair. The low touch services strategy also reinforces Dell's low cost strategy.

## 6.2.3 Dell's Operational Objectives

Dell's operating model is aligned towards achieving cost reduction/efficiency improvement, inventory minimization and cash-to-cash cycle reduction. It can be concluded that Dell's primary operational objectives are efficiency and asset utilization. This alone does not mean that Dell is ignorant of its customers. Dell's low cost strategy increases the satisfaction of price conscious computer buyers, which is a high growth segment in the computer industry. The direct sale to customer model helps Dell in constantly monitoring changing consumer needs. Dell uses this information in planning new product introductions and serving unmet demands. Further, because of the inherent build to order model, Dell can provide a very high level of customization to its customers. Dell's home delivery of computers helps their customers buy their favorite systems without even stepping out of their homes. All these have helped Dell to be close to its customers.

The following figure (Fig 6.4) graphically shows the different operational objectives of Dell on the three dimensions: efficiency, asset utilization, and customer response. The dotted line represent Dell's primary focus areas.



**Fig 6.4**

## 6.2.4 Dell's Tailored Business Processes

Dell's supplier logistics centers, demand shaping and inbound transportation are some of its tailored business processes that support its operating model and objectives.

### 6.2.4.1 Supplier Logistics Centers

One of the most important requirements of the build-to-order manufacturing is the just-in-time availability of raw material. This requirement is taken care of by Dell's Supplier Logistics Center operation. As described in Chapter 5, the SLCs supply raw material components just in time to Dell's manufacturing facility. The SLCs does this by holding

a minimum level of inventory at all time. It can be argued that the cost saved by Dell because of just-in-time procurement can be eaten up by the cost increase for the supplier because of holding inventory at the SLCs, which eventually gets passed on to Dell as increased component prices. Though this argument has some truth in it, the suppliers are in a much better position to manage inventory by aggregating demand. Further, a strictly enforced inventory policy puts pressure on the suppliers to manage inventory more efficiently. Thus Dell drives efficiency in the whole supply chain. Dell takes on some responsibilities of the SLC inventories by demand shaping and co-managing inventory policies. Dell also regularly shares forecasted demand information with its suppliers. This helps the suppliers to plan in advance to meet the minimum inventory requirement at the SLCs. Third party service providers on behalf of the customers run these SLCs. To ensure that the SLC operations are seamlessly integrated with that of the manufacturing facility, Dell sets the operating standards and procedures for the third party service providers to follow. Dell has also integrated the IT systems of SLCs with its internal systems to get complete visibility of SLC operations.

#### 6.2.4.2 Demand Shaping

Through artificially changing price, lead-time of delivery, promotion and upgrade as described in Chapter 5, Dell shapes customer demand to take care of any unplanned shortage or oversupply of inventory. If a particular product is in low supply or out of stock, Dell provides cost-effective alternative options to its customers to avoid lost sales and customer dissatisfaction. On the other hand, if a particular product is in over supply, Dell reduces its price to avoid inventory carrying and obsolescence costs. Demand

shaping also ensures that the limited inventory that is maintained in the SLCs does not become an operational bottleneck for Dell.

#### 6.2.4.3 Inbound Transportation Optimization

Even though Dell does not take ownership of any inventory until it reaches the Dell facility, it actively manages the inbound transportation network for its suppliers. This reinforces Dell's both high efficiency and low cost strategy. Through transportation planning Dell collates the transportation requirements of all its suppliers and negotiates aggressively with transportation service providers. This also provides Dell greater control and visibility in its inbound inventory. Higher inventory visibility helps Dell's SLC and demand-shaping model that requires real time inventory information.

## 6.3 IBM vs. Dell

IBM and Dell are renowned for their superior performance in this industry, and are benchmarks for best practices in supply chain management. Interestingly, in spite of their remarkable success, both of these companies have very different operating models. This observation helps us to realize that there is no the right operating model for a company to be successful, even for companies in the same industry. Thus the effectiveness of a company's operating model could be judged only in the context of its business strategy. Although both IBM and Dell operate in the same industry, their business strategies are very different from one another. IBM, for example, moved away from being a hardware manufacturer to being a one-stop IT solutions provider as computers became like a commodity product. IBM's world-class customer fulfillment processes and seamless coordination between different business units support this business strategy. On the other hand, Dell has largely remained focused on selling computers at the lowest price by constantly squeezing costs out of its supply chain. Dell's direct sales to customer and build-to-order manufacturing systems support its "low cost" business strategy.

As discussed in chapter 6, the operational objectives of a company are defined based on the company's operating model. Since IBM and Dell follow quite different operating models, their operational objectives are also not comparable. For example, because of IBM's heavy commitment in enhancing customer value, many of its operational objectives are customer driven. On the other hand, because of Dell's heavily committed in continuously driving down the cost of operations; many of its operational objectives

are efficiency and asset utilization driven. From this alone one may not conclude that both of these companies are weak in areas where they are not primarily focused on. For example, even though IBM is heavily focused on providing high touch customer service, it is by no means negligent of its operations. But rather, IBM measures its operational effectiveness in the broader context of their service level measurements. On the other hand, even though Dell is heavily focused on efficiency and asset utilization, it is by no means negligent of its customer service. Rather, Dell measures its customer service in the broader context of its operational efficiency and asset utilization.

Finally, the supply chain processes of these two companies are also quite different from one another. This is as expected, as they support different operating models and operational objectives. In the case of IBM, its integrated customer fulfillment, launch-buffer manufacturing, centralized procurement, and consolidated logistics practices support its diversified product portfolio and high service level strategy. Dell's efficient SLCs, tactical demand shaping, and optimized inbound transportation support its fiercely efficient operations strategy.

To conclude, both the supply chains of IBM and Dell are world class in their respective ways. Even though comparing these two supply chains is an informative exercise, it would be futile to judge the superiority of one over another. This is because both these companies serve very different customers needs with different operating models and measurements of success.



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