Industry and Competitor Analysis : Apple Computer 1990s

1990年代に於けるアップル社の経営戦略

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＜要　約＞

この論文はケーススタディである。目的はパソコンをどのように使うか説明することではなく、また、パソコンの技術について述べることでもない。それはビジョンおよび企画能力を持った企業のリーダーについてである。それによって多くの人々の人生が変わってきた。それはまさにスティーブ・ウォズニアック、スティーブ・ジョブスおよびジョン・スカリーがした業績である。この考えは「世界を変えた」や「ルック・アンド・フィール」（それは有名なマッキントッシュに基づいた理論である）に示され、それはアップル・コンピュータ社（今の Apple Inc）のビジネスの成功に見られる。しかし、アップル・コンピュータ社の経営者はパソコン産業の変化を読み取れなかったので、アップル・コンピュータ社のリーダーシップを失ってしまった。その企業の経営について何が悪かったのか理解するために、主要な競争相手がどこで巧くいったのか理解することは重要である。その分析は米国の市場が中心になった。なぜならば、ソフトウェアの販売における主体がそこから始まり、そしてヨーロッパ、次に日本へと広がったからである。

＜ Key Words ＞

ROE, proprietary system, open system, ISV, superstores, VARs, horizontal and vertical integration, marketing mix.

Preface

This paper is a case study. Its aim is not to explain how a personal computer works. It is not about technology either, but it is about people with vision and their ability to change other people's lives. That is exactly what Steve Wozniak, Steve Jobs and John Sculley did. They *"changed the world"* with an idea: *"look and feel"*, which is the theory behind the famous Macintosh. They created a successful business: Apple Computer Inc, now Apple Inc. The business lost its leadership in computers long ago, because its leaders

missed read the changed that occurred in the industry. In order to understand what Apple computer did wrong, it is important to take a look at what its main competitors did differently. However, the analysis will focus on the U.S. market only, because trends in software and distribution is said to have started there and spread to Europe then to Japan.

The paper is organized as follow: Part I is the introduction and it relates the crisis the computer industry went through in 1991. Part II briefly relates Apple Computer history. It shows how Steve Wozniak and Steve Jobs objective to change the world started. Part III describes the personal computer industry in the U.S. It also explains how the personal computer business evolved; how the distribution was organized; and which companies were Apple Computer competitors. Part IV relates Apple Computer's position in 1990 and highlights its uniqueness. Part V is about Apple Computer new manufacturing, marketing, and "federation alliances building" strategy. This would allow Apple computer to stay ahead of competition. Part VI is the conclusion.

Ⅰ. Introduction

In 1991, the computer industry experienced its worst year in history. Average return on sales dropped to under 4 percent and the ROE (Return On Equity) was under 11 percent. Worldwide, PC revenues dropped for the first time by nearly 10 percent. Apple continued to perform better than its competitors in the industry, but the intensity of competition was putting pressure on Apple's margins. "Our challenge," said John Sculley, Apple Computer's CEO, "is not only to stay ahead of our competition, but we have to find some way to change the rules of the game. If computer manufacturers continue to make and sell commodities, everyone in our business will suffer."

The objective then was to change a $50 billion global industry. Sculley certainly knew that was not going to be an easy task, but he believed that Apple was one of the only companies that could do it. Therefore, for Apple's next strategy session, he asked his staff to address two key questions: (1) could Apple change the structure of the industry, and if so how? And (2) what other alternatives were available?

Ⅱ. Apple Brief History

Steve Wozniak (Woz) and Steve Jobs triggered the history of Apple when they started the Apple I computer in the Jobs family garage in Cupertino. They formed Apple

Computer Inc. on April 1976. They had already sold 200 Apple I computers, mostly to hobbyist, when they managed to obtain venture capital. Jobs vision was to make the personal computer easy to use for nontechnical people. His stated vision through 1992 was "to change the world through technology." The concept was one computer for every man, woman, and child.

Jobs and Woz really started to change their company and the world in March 1977 when they announced the Apple II. Apple sold more than 100,000 Apple IIs by the end of 1980, generating over $100 million.[1)] They mostly sold into homes and schools, and the company was recognized as the industry leader.

The company went public in December 1980. In 1981, with IBM entering the personal computer market, Apple's competitive position changed completely. Although Apple's revenues continued to grow, market share and margins fell dramatically. Apple reacted to IBM threat through innovation, by launching the Lisa and Macintosh (Mac). These innovative computers featured a graphical interface and a windowing operation system that allowed the user to view and switch between several applications at once. They also used a mouse to move and point to positions on the screen, making applications easier to use. However, these two computers were incompatible with IBM standard and even with the Apple II. Lisa Computer was soon dropped mostly because it was expensive, ($10,000). The Macintosh too was loosing momentum because of limited software and low performance. By 1984, the company was in crisis.

A few months before Lisa and Macintosh introduction, Apple hired John Sculley as its president and CEO. He was then 44 and previously president of Pepsi's beverage operations, where he was in charge of marketing and advertising. At Apple, Sculley's job was to provide the operational expertise and Steve Jobs the technical direction and vision. But Jobs had to resign from Apple in 1985 after a dispute with Sculley and Apple's board of directors.

Apple introduced a new Mac between 1986 and 1990 that matched the newest IBM personal computers in speed and sales exploded (see Exhibit 1). The important thing with this new Mac was that, it offered superior software and a variety of peripherals (e.g., laser printers) and that gave apple a great advantage in the market – the easiest computer to use in the industry with unmatched capabilities at desktop publishing. The strategy adopted by Apple as the only manufacturer of its hardware and software made the company very profitable in the industry. By 1990, Apple had more than $1 billion in cash and more

than $5.5 billion in sales. Return on Equity was at 32 percent and was one of the best in the industry. Market share was at 10 percent.[2)]

Ⅲ. The Personal Computer Industry[3)]

In 1991, the personal computer enhanced information technology and represented $50 billion in hardware business and $30 billion in software and peripherals. The industry seems to have evolved through three successive periods during 15 years. The first six years were characterized by massive growth and multiple small competitors seeking for a share of the market.

The second stage in desktop computing started when IBM launched its IBM PC. The following five years in the industry was a war for standards and retail shelf space, from which three firms emerged as the clear leaders: IBM, Compaq, and Apple.

The third period showed an increasing fragmentation of the market. From 1986 to 1992, new manufacturers of IBM clones from around the world grabbed share from the industry leaders, a new channels of distribution emerged, consequently product innovation as well as revenue growth slowed down.

During the early years of the industry, venture capital in the United States encouraged the entry of new firms, which offered products in every conceivable shape and size. New entrants flooded the market, promoting distinct standards and unique technical features. Every firm had a different configuration of hardware and software, making communication or sharing applications almost impossible.

Before IBM entered the market in 1981, most products were considered "closed" or proprietary systems. A closed system, like mainframes, minicomputers, and Apple's PCs, could not be copied because it was protected by patents or copyrights, which rendered the computer incompatible with competitors' products. IBM's entry offered an "open system". The advantage IBM's PC had was that, they were easy to obtain which allowed independent hardware companies to make compatible machines and independent software vendors (ISVs) to write applications that would run on different brands. For customers, open system offered a big advantage because they were no longer locked into a particular vendor's product, and they could mix and match hardware and software from different

competitors to get cheapest system price. As long as manufacturers could buy the key components, particularly Microsoft's DOS (disk operating system) and Intel's X86 family of microprocessors, they could manufacture a product that could piggyback on IBM's coattails. Between 1982 and 1986, the majority of the industry consolidated around IBM's MS-DOS Intel X86 microprocessor standard. Among the various propriety PC systems, which had included names such as DEC, Xerox, and Wang, only Apple did not follow.

The open system created by IBM may have fostered imitators but none could match its brand name and product quality. As a matter of fact, IBM captured nearly 70 percent of the Fortune 1000 business during its first four years. IBM rose along with Compaq, which build IBM – compatible machines with a strong reputation for quality and high performance.

Growth in PCs was built partly on hardware innovation and partly on software applications. In the first five years IBM and compatibles went through four major hardware product generations – the PC (based on Intel 8088), PC XT (based on 8086) a hard drive), PC (based on Intel 80286), and 80386 PCs; in the meantime, Apple went from the Apple II to Macintosh – which was seen a revolution in user-friendliness and functionality. The PC explosion was also fuelled by software applications. Programs like Lotus 1-2-3 and WordPerfect were nicknamed "killer Apps" because they were so powerful compared to their predecessors, and everyone wanted them. Most programs for business applications were written for the IBM standard, while Apple dominated educational applications and graphics.

IBM faltered in the late 1980s when it tried to make PCs more proprietary with the introduction of its PS/2 line of computers. Old IBM PC boards could not be plugged into the PS/2. However, many customers did not want to give up their prior purchases, and IBM lost almost half of its market share. New generation of PC clone such as Dell and Gateway also discovered that most customers could no longer make the difference between low-priced and premium brands. In the end, the biggest differentiation in the industry had been between standards – IBM versus Apple. Then, when Microsoft introduced its "window" 3.0 graphical user interface in 1990, the differences in user-friendliness between MS-DOS/Intel machines and Macs narrowed substantially. By the 1992, the PC business changed from a high-growth industry to an industry with few high-growth segments. New products, like notebook computers, and traditional products sold through new channels, like direct mail.

A. Distribution and Buyers

The PC market could be divided into three categories: business/government; education; and individual/home. However, the largest segment was business, with something like 60 percent of the units and 70 percent of the total revenue.[4] During the year 1980s, the PC buyers were individual or small departments in corporations without much input from staff. And individual business buyers were usually unsophisticated about the technology and worried most about service, support, and compatibility. Brand name was very important and full-service computer dealers, like Businessland and ComputerlLand made great profit servicing these customers.

By the early 1990s, individual business consumers knew a lot about the PC; and more and more computers buyers were well trained. Then, there were a shift in the market. Full-service dealers had become an expensive channel. Demand exploded at "superstores" like CompuAdd and Staples as well as at mail order outlets, which offered computers and peripherals at 30-50 percent off list price. Even mass merchandisers like K Mart, Costco etc... started to sell large volumes of PCs. (See Exhibit 3.) Then another channel appeared, called value-added resellers or VARs. VARs particularities were the fact that they low-overhead operations and that they could buy computers in volume, package them with software or peripherals, and then configure the PCs into networks. In the end, computer manufacturers bypassed third-party distribution entirely, selling directly through the mail with phone support for customer service.

The education market accounted for 9 percent of units and 7 percent of revenues. Most school had limited budgets for computers, what most educators were interested the most in was the availability of suitable software. As for the individual/home market, it accounted for 31 percent of units and 23 percent revenues.

B. PC Manufacturers

In 1991, the four largest PC manufacturers are said to have been IBM, Apple, NEC, and Compaq. They accounted nearly 37 percent of the world market. (See Exhibit 3.) More than 200 companies were from a dozen countries.[5] U.S. firms had over 60 percent of global revenues, Taiwanese small companies, like Acer, were gaining share in the very low end, and Japanese firms were the biggest manufacturers in portable computers. Toshiba, a huge Japanese conglomerate, dominated laptops with (26 percent share in 1990), followed by NEC (15 percent).

In 1992, many buyers could not easily make the difference between IBM and no-name PC brands, which allowed prices to drop, thanks to competition. For example, on the same day of February of 1992, Apple and Dell Computer both cut prices by nearly 40 percent. Within a week other competitors did the same. However, Apple still had as main competitors, IBM, the worldwide leader; Compaq, the premium-priced leader in the MS-Dos/Intel segment and Dell, a low-priced clone.

1) IBM

In the 1990s, IBM had a large installed base of customers that was tied to the company's highly profitable, proprietary technology. But like most mini and mainframe companies, IBM was also a relatively high-cost producer of PCs that was struggling to create a unique position for itself. IBM did suffer it first loss in history in 1991, but still was the world leader in computers, with $64 billion in revenues and the number one market share in PCs, minicomputers and mainframes. (See Exhibit 4).

IBM trademark was its horizontal and vertical integration. It had the largest direct sales forces in the computer industry and sold more types of computers, software, and peripherals than any other company in the world. IBM's R&D budget of $6.6 billion exceeded the revenues of all but a few competitors. Its market share had steadily declined in the PC business since 1984. Its products lost much of differentiation as clones successfully attacked IBM with cheaper and sometimes with technically superior products; and after a dispute with Microsoft, IBM appeared to lose control over the operating system software. In order to regain the initiative, IBM launched alliances in the 1990s, with Siemens for joint development of the next generation of memory chips; with Toshiba for flat panel displays; with Apple for the next generation operating system; and with Motorola for microprocessors.

2) Compaq

Compaq started by selling the first successful IBM clone portable, and made $100 million in sales, which made it the fastest-growing company in history. Compaq growth and profitability were based on offering more power or features than comparable IBM's, at slightly higher prices. By launching the first PC with an Intel 80386 microprocessor, it became a trend-setter rather than just another clone.

Compaq generally engineered its products from scratch, developing and

manufacturing many customs components. However, it did not make semiconductors like IBM, and did not develop software or manufacture peripherals, like Apple. It was a pure PC hardware company that sold its products through full service dealers.

However, Compaq position weakened sharply as clones were quickly copying its PCs and were sometimes beaten on the market by some new products. The greatest damage was done by Dell Computer, which ran full-page ads in newspapers around the world by suggesting that Dell offered comparable value at 50 percent off Compaq's list price. Although the allegation was not true, Compaq was put on the defensive with its customers, which caused it to cut prices and streamline costs. Its CEO was later fired and the company adopted a new strategy by reducing cost and offering low-priced products through lower-cost channels.

3) Dell Computer

Michael Dell started Dell Computer in Austin, Texas in 1984. The company first product was an IBM PC/XT clone that he sold through computer magazines at one-half IBM's prices. From 1985 to 1990, Dell became the fastest-growing computer company in the world. By 1991, it was a half-billion-dollar company, offering a full line of PCs through direct mail. Dell distinctive strategy was: its unconditional money-back guarantee within 30 days, its toll-free customer service number, and a one-year contract with Xerox to provide next-day, on-site service within 100 miles of nearly 200 locations.

Dell generally copied Compaq or IBM's basic design while assembling the products with standard components. However, in 1992 Dell started to feel pressure from lower-priced clones such as ALR, Packard Bell, and Gateway. They copied Dell and offered even lower expense structure and lower prices. Dell was force to look for new strategy to differentiate its products through innovation. By 1992, Dell was introducing new PCs every three weeks; its oldest product was 11 months old.

4) Suppliers

The personal computer industry offered two categories of suppliers in early 1990s. Those supplying products had multiple sources, like disk drives, CRT screens, keyboards, computer boards and memory chips; and those supplying microprocessors and operating system software.

Many companies offered microprocessors, but two companies dominated the industry: Intel, the sole source for the latest generation (386, 486, Pentiums) of chips for the MS-DOS standard; and Motorola, which supplied 100 of Apple's needs.[6] (See Exhibits 4 and 5.) Similarly, there were only two major suppliers of software operating systems (OSs) for the PC market – Apple and Microsoft (See Exhibit 4).

Ⅳ. Apple Position In October 1990

Apple's position in the computer industry was special in the early 1990s. It was the only existing alternative hardware and software standard for PCs other than the MS-DOS/Intel standard. It was also unique because it was more vertically and horizontally integrated than any other PC company, with the exception of IBM.

Apple historically designed its products from scratch, chips, disk drives, monitors, and a unique shape for its chassis. It developed its own operating systems software for the Mac, some of its applications software, and many of its peripherals, such as printers. About half of Apple's revenues came from overseas, and roughly half the U.S. sales were to education, where it had more than 50 percent market share.

Apple's products were considered to be easier to use, easier to network and more versatile than comparable IBM machines. It gave customers a complete desktop solution. Hardware and operating system software were sold as a package, bundled together. This made Apple's customers to be the most loyal in the industry.

However, Apple started having trouble as it had not aggressively lowered prices during the price war in the late 1980s. In addition, the fact that Motorola, which was Apple' s sole source for microprocessors was delayed in shipping its newest products, damaged Apple's image in the 1990 as a performance leader. Suddenly Apple's computers looked overpriced and underpowered. There were even more problems, according to John Sculley: *We were increasingly viewed as the "BMW" of the computer industry. Our portfolio of Macintoshes were almost exclusively high-end, premium-priced computers that our market research suggested would continue to have limited success on penetrating the corporate marketplace. Without lower prices, we would be stuck selling to our installed base. We were also so insular that we could not manufacture a product to sell for under $3000. We constantly fell into the trap of "creeping elegance" with our NIH – not invented here –*

mentality. We spent more than two years, for instance, designing a portable computer that had to be "perfect." But in the end, it was a disaster – it was 18 months late and 10 pounds too heavy. Our distribution was also an issue. Five large dealers were selling 80 percent of our products. Given the evolution of the computer industry, we concluded that drastic action was necessary; there could be no sacred cows. The result was a dramatic shift in Apple' s strategy and culture. We still want to change the world, but we have to transform the company and industry for it to work. We cannot permit the commoditization of this industry to continue.

V. THE NEW APPLE

In October 1990, Apple opted for a new strategy: repositioning itself in the industry. This included new financial and manufacturing policies, a new marketing mix (new products, pricing, and distribution), and new relationships with other companies, as well as its own subsidiaries, IBM, and a several Japanese firms.

A. New Marketing Mix

The objective for Apple was to enter the mainstream with products and prices designed to regain market share. With that philosophy, Apple decided to expand its product portfolio to include low-cost, low-priced computers for the larger business and individual market. Then Apple introduced its $999 Mac Classic which allowed it to be able to compete with the closes. (See Exhibit 3) Sales of Macs rose from 9.8 to 17 percent one year later.

Apple other strategy was also to get products out faster and extend the hardware and software products lines, in order to differentiate itself from competition. In late 1991 and early 1992, Apple launched a new generation of notebook computers called Powerbooks; then in January 1992, it introduced a new software product, called Quicktime, which put Apple at the forefront of multimedia technology. A month later, Apple announced a software that would allow Macs to respond to commands from the human voice, without special hardware or training.

Apple also had to restructure its distribution. It maintained a direct sales force of nearly 300, one-third covering large corporate accounts, two-thirds focused on education and other markets. In late 1991, Apple decided to sell its products through superstores and started to offer limited direct end-user telephone support.

B. Finance and Manufacturing

Apple financial model was based on the following principal, Sculley's "50-50-50" rule: That means, if Apple could sell 50, 000 Macs a month, with a gross margin of 50 percent, Apple would have a stock price of $50. According to Sculley, these high gross margins were justified by the fact that Apple had to find a way to pay for its huge research and development expenses to support a proprietary technology. In the end, a crisis emerged and Apple had to cut its workforce by 10 percent or 1,560 people. And manufacturing now had new instructions: Anything that could be bought on the outside had to be subcontracted rather than developed.

C. Relationships with Other Companies

According to Sculley, Apple new strategy in this area was to build a "federation" of alliances with partners that could help leverage Apple's strengths in software, especially user-friendliness, multimedia, and networking. Apple needed to have partners and become more open in order to be able to penetrate a broader market. As for its first partner, Apple surprisingly chose IBM. They formed two joint ventures – Taligent and Kaleida.

Taligent was formed in order to develop Apples next generations OS, called Pink.[7] But Apple needed money and a broader market. The concept of IBM – Apple relationship was that both companies could share the cost and risks of developing new technologies, but the parents would compete in the market place for computers. IBM would provide the semiconductor technology while Apple would provide most of the software technology and personnel.

VI. CONCLUSION

From an international marketer point of view, the years 1990s have been very fascinating in the computer industry, in term of innovation. With so many players involved and so much at state, the only beneficiary has been the customer. From a $10,000 computer in the early 1990s to a $400 one now days we have come a long way. However, the industry must continue to be innovation driven and provide value-added products and services. Apple computer lost its leadership in the industry because it had missed read the shift in the market. Therefore, monitoring the market must be part of every company strategy. In 1992, the new CEO, Sculley objective was to change the industry structure, through new alliances and innovation. That objective has been fulfilled because Apple is constantly on the daily news with new products. That means Apple remains a dynamic and a successful company.

EXHIBIT 1
DETAILED FINANCIALS OF APLE OVER TIME

	1991	1990	1989	1988	1987	1986	1 985	1984	1983	1982	1981
Total revenues ($ millions)	6,309	5,558	5,284	4,071	2,661	1,902	1,918	1,516	983	583	334
Cost of sales	3,314	2,606	2,695	1,991	1,296	891	1,118	879	506	288	170
R&D	583	478	421	273	192	128	72,5	71	60	38	21
Marketing and distribution	1,740	1,556	1,340	908	655	477	478	399	230	120	55
General and administrative	224	207	195	180	146	133	110	82	57	35	22
Operating income	447	712	634	620	371	274	103	86	130	10266	
Net income	310	475	454	400	218	154	61.3	64.1	77	61	39
Property, plant, equipment, and other	275	321	284	186	121	67	66	53	64	30	NA
Depreciation and amortization	204	202	124	77	70	51	41	37	22	16	NA
Cash dividends paid	56	53	50	39	15	--	--	--	--	--	NA
Cash and temporary cash investment	893	997	809	546	565	576	337	115	143	153	73
Accounts receivable	907	762	793	639	406	263	220	258	136	72	42
Inventories	672	356	475	461	226	109	167	265	142	81	104
Property, plant, and equipment	448	398	334	207	130	222	176	150	110	57	31
Total assets	3,494	2,976	2,744	2,082	1,478	1,160	936	789	557	358	255
Total current liabilities	1,217	1,027	895	827	479	138	90	255	129	86	70
Total shareholders' equity	1,767	1,447	1,486	1,003	837	694	550	465	378	257	177
Permanent employees	12,386	12,307	12,068	9,536	6,236	4,950	4,326	5,382	4,645	3,391	2,456
International sales/sales(%)	45	42	36	32	27	26	22	22	22	24	27
Gross margin/sales (%)	47	53	49	51	51	53	42	42	49	51	49
R&D/sales (%)	9	9	8	7	7	7	4	5	6	7	6
ROS *(%)	4.91	8.55	8.59	9.83	8.19	8.10	3.20	4.23	7.83	10.46	11.68
ROA** (%)	8.87	15.96	16.55	19.21	14.75	13.28	6.55	8.12	13.82	17.04	15.29
Stock price range	1991 (40.5 -73.3)	1990 (24.3 -47.8)	1989 (32.5 -50.4)	1988 (35.5 -47.75)	1987 (20.3 -59.8)	1986 (10.8 -22)	1985 (7.3 -15.6)	1984 (10.8 -17.25)	1983 (8.6 -31.6)	1982 (5.5 -7.5)	1981 (6.8 -73)
PE/ratio	12.9	10.5	12.9	13.6	20.3	11.6	22.1	26.7	30.6	16.1	24.3
Market value***	6,751	4,150	5,166	5,033	4,914	2,004	1,360	1,694	2,368	742	1,320

Sources: Apple annual reports and Value Line.
*ROS = net income/total revenues.
** ROA = net income/total assets.
***Year-end stock price times the number of shares outstanding.

EXHIBIT 2

PC DISTRIBUTION CHANNEL BREAKDOWN*

	Direct	Dealer	Superstore	VAR	Mass Merchant	Consumer Electronics	Mail Order
(%) of Total							
Units Shipments							
1987	17.4	58.9	0	11.3	3.4	4.1	4.3
1988	12.3	61.7	0	12.4	3.9	4.3	4.8
1989	8.6	63.2	0	13.9	4.1	4.7	4.8
1990	8.0	58.3	1.1	14.7	5.2	5.2	6.1
1991	7.9	55.7	2.0	15.2	6.4	6.4	6.2
1992**	8.3	51.6	2.9	15.7	7.5	7.5	6.2
(%) of Total							
Value Shipments							
1987	31.0	49.0	0	13.2	1.4	1.8	2.3
1988	25.3	52.9	0	14.7	1.7	1.9	3.2
1989	17.3	56.	0	17.1	1.9	2.1	3.7
1990	18.4	52.7	0.7	18.0	2.9	2.5	5.1
1991	14.7	51.7	1.6	18.7	3.9	3.7	4.6
1992	14.4	50.0	2.5	19.0	4.1	4.0	4.9

Source: Compiled from International Data Corporation data, 1991.
*Estimated sales do not equal 100% because of rounding
**Projected figures

EXHIBIT 3
ESTIMATED PC WORLDWIDE MARKET SHARE RANKED BY MANUFACTURER REVENUE*

Rank	Company	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1	**IBM (%)**	**6.04**	**11.47**	**21.34**	**29.96**	**29.04**	**25.28**	**25.27**	**21.54**	**18.65**	**17.94**	**16.05**
2	Apple	8.82	7.34	7.10	10.10	8.78	7.98	7.99	8.83	9.98	10.22	10.49
3	NEC	3.92	4.30	4.79	4.64	6.33	6.70	7.11	6.04	5.65	5.81	5.79
4	Compaq	0.00	0.00	0.73	1.52	2.25	2.48	3.47	4.93	5.36	4.77	4.44
5	Olivetti	2.27	2.08	1.76	1.28	2.63	3.37	3.14	3.12	2.79	2.92	3.10
6	Toshiba	0.60	1.68	0.94	0.46	0.24	0.74	1.32	1.58	1.68	2.44	2.72
7	Epson	0.00	0.01	0.41	0.62	0.66	0.96	1.26	1.81	2.11	2.39	2.67
8	Tandy	10.57	10.42	7.22	3.92	4.32	3.66	3.14	2.81	3.28	2.38	2.57
9	AT&T	0.63	0.35	0.39	0.98	3.18	3.24	2.95	2.70	2.13	1.92	2.09
10	Zenith	2.03	1.65	1.30	1.24	1.71	2.31	2.78	3.05	2.60	1.70	1.79
11	Philips	0.73	0.59	0.97	0.98	1.33	1.70	1.45	1.25	1.60	1.83	1.75
12	Siemens	0.00	0.00	0.01	0.05	0.26	0.62	1.14	1.45	1.51	1.58	1.62
13	HP	2.66	2.25	2.26	2.66	2.70	2.20	1.44	1.74	1.81	1.67	1.58
14	Acer	0.27	0.63	0.25	0.21	0.28	0.58	0.92	1.28	1.29	1.34	1.30
15	Packard Bell	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.13	0.72	1.05	1.20
16	Unisys	0.64	2.57	2.27	2.74	2.87	2.27	2.01	1.81	1.58	1.36	1.11
17	Dell	0.00	0.00	0.00	0.02	0.11	0.23	0.46	0.63	0.74	0.99	0.10
18	Other (%)	60.83	54.66	48.26	38.62	33.30	35.71	34.13	35.29	36.54	37.68	38.18

EXHIBIT 3 (CONTINUED)
ESTIMATED PC WORLDWIDE MARKET SHARE BY INSTALLED UNIT*

Company	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
IBM (%)	**1.35**	**2.73**	**4.60**	**8.63**	**11.09**	**2.07**	**13.12**	**13.68**	**13.68**	**13.36**	**12.81**
Apple	8.85	6.65	6.09	7.80	8.27	8.22	8.23	8.21	7.98	7.63	7.90
NEC	4.28	3.55	3.77	4.53	5.23	5.53	5.63	5.51	5.35	4.97	4.79
Compaq	0.00	0.00	0.27	0.70	1.08	1.37	1.66	2.04	2.38	2.57	2.74
Olivetti	1.78	1.03	0.78	0.68	0.99	1.25	1.50	1.69	1.79	1.72	1.66
Toshiba	0.29	0.86	0.84	0.74	0.68	0.77	0.83	0.98	1.18	1.59	1.98
Epson	0.00	0.01	0.18	0.38	0.50	0.70	0.95	1.36	1.85	2.18	2.40
Tandy	0.00	0.00	0.00	0.00	0.00	0.12	0.33	0.48	0.64	0.80	0.89
AT&T	0.26	0.10	0.09	0.25	0.79	1.08	1.24	1.34	1.33	1.24	1.20
Zenith	0.98	0.66	0.53	0.56	0.80	1.14	1.60	2.02	2.18	2.05	1.96
Philips	0.20	0.19	0.22	0.25	0.38	0.53	0.62	0.76	0.91	1.03	1.08
Siemens	0.00	0.00	0.00	0.02	0.06	0.14	0.27	0.41	0.53	0.61	0.68
HP	1.29	1.00	0.96	1.08	1.19	1.20	1.07	1.04	0.92	0.84	0.84
Acer	0.21	0.20	0.13	0.16	0.25	0.44	0.76	1.12	1.37	1.55	1.68
Packard Bell	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.34	0.58	0.80
Unisys	0.18	0.33	0.36	0.46	0.51	0.60	0.71	0.75	0.76	0.70	0.65
Dell	0.00	0.00	0.00	0.01	0.05	0.11	0.23	0.30	0.38	0.47	0.59
Other (%)	80.32	82.69	81.18	73.73	68.14	64.73	61.23	58.24	56.43	56.12	55.34

Source: Adapted from InfoCorp data.

* Market share includes all computer sales under $12,000. Commodore and Sharp have been included in the "other" category even though their share exceeds 1 percent. However, both companies derive a large percentage of their revenues from nontraditional computer products (e.g., palmtop computers, organizers, and computer designed primarily for entertainment), which are not directly compare to IBM PCs and Macs.

EXHIBIT 4
SELECTED COMPETITOR/SUPPLIER FINANCIAL STATISTICS – 1882 – 1992 ($ MILLIONS)

IBM	1991	1990	1988	1986	1984	1980
Revenues ($)	64,792	69,018	59,681	51,250	45,937	26,213
Cost of goods sold	32,474	30,723	25,648	22,706	18,919	10,149
R&D expense	6,644	6,554	5,925	5,221	4,200	1,520
Selling, general, and administrative	24,732	20,709	19,362	15,464	11,587	8,804
Net income	-2,827	6,020	5,491	4,789	6,582	3,563
Total assets	92,473	84,568	73,037	63,020	42,808	26,703
Long-term debt	13,231	11,943	8,518	6,923	3,269	2,099
Stockholders' equity	37,006	42,832	39,509	34,374	26,489	16,453
ROS %*	-4.4	8.7	9.2	9.3	14.3	13.6
ROA%**	-3.1	6.8	7.5	7.6	15.4	13.3
ROE%***	-7.6	14.8	14.9	14.4	26.5	22.7
Stock prices ($/share)						
High	139.8	123.1	130	162	128.5	72.8
Low	92	94.5	104.5	119	99	50.4
P/E ratio	21.2	10.4	11.9	18	10.6	10.4
Market Value****	50,285	64,523	70,210	72,720	75,399	39,115

EXHIBIT 4 (Continued)
SELECTED COMPETITOR/SUPPLIER FINANCIAL STATISTICS – 1882 – 1992($ MILLIONS)

Compaq	1991	1990	1988	1986	1984
Revenues ($)	3,271	3,598	2,066	625	329
Cost of goods sold	2,057	2,058	1,233	361	232
R&D expense	197	185	75	27	11
Selling, general, and administrative	721	706	397	152	66
Net income	131	455	255	43	13
Total assets	2,826	2,717	1,582	378	231
Long-term debt	73	74	275	73	0
Stockholders' equity	NA	1,859	815	183	109
ROS%*	4	12.6	12.3	6.9	3.9
ROA%**	4.6	16.7	16	11.3	5.6
ROE%***	6.9	30	42	26.8	12.9
Stock prices ($/share) High	74.3	68	33	10.8	7.3
Low	29.9	35.5	21	5.8	1.8
P/E ratio	28.2	10.3	8.9	11.7	14.5
Market Value****	2,244	4,852	4,312	1,026	325

EXHIBIT 4 (Continued)
SELECTED COMPETITOR/SUPPLIER FINANCIAL STATISTICS – 1882 – 1992 ($ MILLIONS)

Dell Computer***	**1992**	**1991**	**1990**	**1989**	**1988**	**1987**
Revenues ($)	890	546	389	258	159	70
Cost of goods sold	608	364	279	176	109	54
R&D expense	33	22	17	7	6	6
Selling, general, and administrative	180	114	80	50	27	10
Net income	51	27	5	14	9	2
Total assets	560	264	172	167	56	24
Long-term debt	42	0	0	0	0	0
Stockholders' equity	274	112	80	75	9	3
ROS %*	5.7	4.9	1.3	5.4	5.7	28.6
ROA%**	11.9	10.2	2.9	8.4	16.1	8.3
ROE%***	18.6	24.1	6.3	18.7	100	66.7
Stock prices ($/share)						
High	NA	36.3	18.8	10.6	12.6	NA
Low	NA	15.8	4.6	5	7.7	NA
P/E ratio	NA	13.2	8.3	26	12.5	NA
Market Value****	900	614	339	108	187	NA

EXHIBIT 4 (CONTINUED)
SELECTED COMPETITOR/SUPPLIER FINANCIAL STATISTICS – 1882 – 1992 ($ MILLIONS)

Intel	**1991**	**1990**	**1988**	**1986**	**1984**	**1982**
Revenues ($)	4,778	3,921	2,875	1,265	1,629	900
Cost of goods sold	1,898	1,638	1,295	687	774	467
R&D expense	618	517	318	228	180	131
Selling, general, and administrative	765	616	456	311	316	NA
Net income	818	650	453	-173	198	30
Total assets	6,292	5,276	3,550	2,080	2,029	1,056
Long-term debt	363	345	479	287	146	197
Stockholders' equity	4,558	3,592	2,080	1,275	1,360	552
ROS %*	17.0	17.0	16.0	-14.0	12.0	3.0
ROA%**	13	12.3	12.8	-10.3	9.8	2.8
ROE%***	20.4	18.1	21.8	-16.3	14.6	5.4
Stock prices ($/share)						
High	59.3	52	37.3	21.5	29	13.8
Low	37.8	28	19.3	10.9	16.5	6.9
P/E ratio	11	12.3	11.4	NA	21.2	48.7
Market Value****	10,045	7,600	4,344	3,717	4,788	5,032

EXHIBIT 4 (CONTINUED)
SELECTED COMPETITOR/SUPPLIER FINANCIAL STATISTICS – 1882 – 1992 ($ MILLIONS)

Microsoft	**1991**	**1990**	**1988**	**1986**	**1984**	**1982**
Revenues ($)	1,843	1,183	591	197	98	25
Cost of goods sold	363	253	148	41	23	NA
R&D expense	235	181	70	21	11	NA
Selling, general, and administrative	596	357	185	76	35	NA
Net income	463	279	124	39	16	4
Total assets	1,644	1,105	493	170	48	15
Long-term debt	0	0	0	2	1	0
Stockholders' equity	1,350	1,105	493	171	31	8
ROS%*	25.1	23.6	20.9	19.7	16.3	16.0
ROA%**	28.2	25.2	25	22.9	33.3	23.3
ROE%***	40.8	37.7	40.3	40.5	70	62.1
Stock prices ($/share)						
High	115	53.9	23.5	8.5	NA	NA
Low	49	28	5.2	6.5	NA	NA
P/E ratio	22.6	19.9	25.2	19.5	NA	NA
Market Value****	19,380	12,788	8,533	NA	NA	NA

Sources: Value Line and companies' annual reports
*ROS = net income/total revenues
**ROA = net income/total assets
***ROE = net income/total stockholders' equity
****Number of shares outstanding (Value Line 1992) times the year-end stock price (NYSE) and OTC daily stock price reports).
Fiscal year ends in February.
Market capitalization as of March 17th

Footnotes

1）Harvard Business School, Feb. 22, 1993

2）Apple annual report 1991

3）The description of the industry will only focus on the U.S. market, because it was said to be the trendsetter in PCs in the 1980s. Trends in software and distribution are said to have started in the U.S.A. and filtered to Europe, then Japan.

4）Harvard Business School, Feb. 22, 1993

5）Different geographic eras had different configurations of competitors: In North America, IBM, Apple, Compaq, and Dell had nearly 70 percent market share. In Japan, NEC had almost 50 percent of the market, but had a relatively low share outside Japan. The European market was dominated by U.S. competitors, with national champions such as Bull, Siemens, and Olivetti commanding large shares of their domestic markets.

6）Apple worked closely with Motorola to design their microprocessor. Since Apple did not allow other vendors to make compatible products, Motorola was essentially a captive supplier to Apple.

7）This new technology, known as "object-based systems," was so complicated that it would take several hundred million dollars and at least three years to complete the project. Pink promised to increase significantly a computer user's productivity by making the writing of customized applications very easy.

BIBLIOGRAPHY

Amelio Gil and Simon L. William. *On the Firing Line: My 500 Days at Apple*, Harperbusiness. 1998

Apple Computer annual reports and Value Line. 1992.

Apple Computer. *Macintosh Human Interface Guideline*, Addison-Wesley.1993

Barllet, L. Christopher; Bower, L. Joseph; Uyterhoeven, E.R. Hugo; Walton, E. Richard. *Business policy, Managing Strategic Processes 8th* ed. Irwin. 1995

Carlton Jim. *Apple: The inside Story of Intrigue, Egomania, and Business Blunders*, Times Books. 1997

Compaq annual reports. 1992

Clapp, Doug. *The Macintosh Reader*, Random House. 1992

Dell Computer annual reports. 1992

Fellows and the president of Harvard College. Harvard Business School. 1993.

Greenberg Keith Elliot, Glassman S. Bruce(editor), Spence Jim (illustrator). *Jobs and Wozniak: Creating the Apple Computer*, Blackbirch Marketing. 1994

IBM Value Line annual reports. 1992

Intel annual reports. 1992

International Data Corporation, 1991.

Intellitrack data. 1991

InfoCorp data. 1991, 1992

Linzmayer W. Owen. *The Mac Bathroom Reader*, Sybex. 1994

Kendall E. Martha. *Steve Wozniak: Inventor of the Apple*, Walker & Company. 1994; 2nd edition, Highland Publishing. 2000

Malone S. Michael. *Infinite Loop: How Apple, the World's Most Insanely Great Computer Company,*

Went Insane, Doubleday. 1999
Microsoft annual reports. 1992
Morgan Stanley. DLJ; annual reports. 1990
Robert X. Cringely. *Accidental Empires* Addition, Wesley. 1992; New edition: Harperbusiness, 1996
Rozakis E. Laurie. *Steven Jobs: Computer Genius*, Rourke Publishing Group. 1993
Sculley John. Program on Information Resources Policy, 1992
Spiesman Harriet. *John Sculley: Building the Apple Dream*. Garret Educational. 1991
Stross E. Randall. *Steve Jobs and the Next Big Thing*, Atheneum (Macmillan). 1993