Chapter 9 The IBM Corporation

9.1 ... Introduction

Prior to the introduction of the PC computer, IBM was in a state of transition. The US Federal Government Department of Justice was ending a long period of litigation into IBM's monopolistic and anti-competitive practices. Although IBM would be successful in its defense of the governments charges, it had caused problems for the corporation. A moderation in marketing and product line expansion had occurred during this sensitive period of litigation. This resulted in a loss of market share for IBM. This was also the period during which Thomas J. Watson Jr., relinquished his role as the head of IBM. The end of a family dynasty. During this time various organizational changes were evaluated. One of the areas of concern was the size of the organization and the effects of the bureaucracy on new initiatives. Consequently the concept of the Independent Business Units (IBU's) was conceived. Frank T. Cary, the IBM chairman and chief executive officer was quoted as saying that the IBU's "might even teach an elephant (IBM) how to tap dance."

The Entry Level Systems (ELS) unit in Boca Raton, Florida had responsibility for the low cost end of IBM's computer business. It was this division that introduced the unsuccessful IBM 5100 portable computer in September 1975. William C. Lowe was the manager of IBM's Entry Level Systems Unit and was promoted to overall laboratory director in 1978.

It was during the period of 1975 to 1979 that the microcomputer market exploded. It started with the release of the Altair 8800 in January 1975, Commodore Pet in 1976, the Apple II and Tandy Radio Shack TRS-80 microcomputers in 1977. The microcomputers of the 1970's were oriented to the hobbyist type of user. The "hackers" got satisfaction and were indeed fascinated by either the electronic or software complexity of building and operating their own computer. During the late 1970's several microcomputer software releases were laying the

foundation for the utilization of microcomputers by business. Those were the word processing program Word-Master in 1978, the Vulcan database in 1979 and of great significance, the financial spreadsheet program VisiCalc in 1979. However at this point in time the business market had not been penetrated to any extent.

The dynamic growth of the microcomputer industry during the late 1970's had not gone unnoticed at IBM. It was recognized by both corporate management and Lowe who initiated a detailed analysis. The leading producers of personal computers in 1979/80 were Apple Computer, Commodore and Tandy Radio Shack. However they had not released products that met the requirements of either the small or corporate business market. This situation was prevalent in not only North America, but also in Europe and Asia. Lowe rationalized that the recognition of IBM as the major international computer manufacturer would be a key factor in the commercial acceptance of a personal computer by their company.

In 1980, IBM released the Model 5120, a desktop version of the unsuccessful 5100 series of portable computers. However, this would not be successful either.

During Lowe's analysis of IBM's possible entry into the personal computer market a number of concerns were identified. The majority of microcomputer developments had been by small entrepreneurial companies. Indeed a number of them such as Apple had been started in a garage. This of course was the opposite extreme from IBM with its extensive bureaucracy. The corporation also tended to engineer all of its components and software in house. This would result in higher than required quality levels that would escalate costs and delay development. Another significant factor was that IBM did not at that time have a microprocessor or the technology. Consequently to compete in the personal computer market would require significant changes at IBM. An organization with greater entrepreneurial type of freedom for development, production and marketing was essential.

Fig. 9.1: William C. Lowe.

Fig. 9.2: Philip D. Estridge.

Figure 9.3: IBM Personal Computer.

Photographs are courtesy of International Business Machines Corporation.

9.2 ... PC Approval and Development

In 1980, John R. Opel was the president of IBM, and all major projects required the approval of the Corporate Management Committee (CMC) at headquarters in Armonk, New York. In July, William Lowe presented to the CMC a personal computer market analysis, his concerns for the product development internally at IBM and two proposals for CMC consideration. One proposal was for IBM to either buy a personal computer company or a personal computer design, such as that from Atari. The second proposal was for IBM to design and build a new personal computer, but to do it outside of the normal corporate structure. To complete this proposal, he requested authorization to assemble a small task force of hand-picked engineers. This group would produce a prototype within thirty days for demonstration to the CMC. Shortly after, the approval to proceed with the new computer proposal was given. Corporate management was anxious to enter the desktop market, the timing had been right.

Funding was granted for twelve engineers to develop the prototype and the detailed commercial proposals. The first person Lowe recruited was Bill Sydnes as manager for the engineering design. Sydnes had been manager of the IBM 5120 desktop computer which had not been a commercial success, but had been developed and produced on time. Lewis Eggebrecht was a principal in the systems engineering design and Joe Bauman was selected to develop the business and manufacturing plans. The rest of the task force was quickly selected. Another member of the founding group was Jack Sams who was in charge of software development. Sydnes and Sams had both been involved in a recent System/23 DataMaster business computer project. This project was delayed by nearly a year due to internal development of the BASIC interpreter. This resulted in the decision to use existing software from outside suppliers. Sams was involved in the initial selection and discussions with Microsoft as a major supplier for software in late July.

The thirty day period to develop and present a prototype to the CMC required that a number of critical decisions be made very quickly by the task force. Some of those were the concept of an open bus architecture, a 16-bit microprocessor, components and peripherals from competitive sources, a software operating system from outside IBM and marketing separate from IBM's sales organization. Maximizing the capabilities of the new computer without affecting the market for IBM's other low end computers required consideration.

In early August Lowe demonstrated the prototype and presented his recommendations for IBM to enter the personal computer market to the Corporate Management Committee. The presentation was a success and the CMC gave approval to form a Product Development Group for the new computer. This group would become one of IBM's Independent Business Units. To maintain confidentiality, code names were assigned to the group and computer. The new group would be known as project "Chess" and the computer as the "Acorn". The timetable required an additional review by the CMC in mid October and the computer to be shipped within one year. The next critical selection for Lowe was a manager for the new group. Lowe had aspirations for higher corporate levels and selected Philip D. Estridge to be the manager of Project Chess in early September.

Don Estridge quickly doubled the engineering staff to twenty six. The final design time frame was extremely short. All of the components had to be state-of-the-art, but be existing and proven in the market. This resulted in a design that was not leading edge, but a conservative product for commercial production and customer acceptance. Some features such as the bus architecture and the keyboard evolved from the IBM System 23 DataMaster computer. David J. Bradley, who had worked on the System/23 DataMaster project, was assigned to develop the control code for the Basic Input/Output System (BIOS). Fully functional prototypes had to be assembled for internal development and outside suppliers of peripherals and software.

By late August IBM was planning for Microsoft Corporation to provide the programming languages.

However the task force was having a problem obtaining a 16-bit version of the popular CP/M operating system from Digital Research, Inc. Then in late September Microsoft made a proposal to supply the operating system (see Section 12.2) and the programming languages. After CMC's final approval of the Chess computer project in October, IBM accepted the Microsoft proposals and a contract was signed in November. IBM also contracted with other software suppliers such as Personal Software to adapt VisiCalc for the new computer.

Other IBM executives were selected to participate in the project and made significant contributions. H. L. Sparks headed marketing and sales, Joseph Sarubbi technical procurement, Dan Wilkie manufacturing and James D'Arezzo communications. D'Arezzo joined the project as manager of communications in January 1981. In March, William Lowe left Boca Raton and became a vice president of the Information Systems Division and general manager of the plant in Rochester, Minnesota. Then in June, Joe Bauman joined Lowe and was replaced by Dan Wilkie as the new director of manufacturing. D'Arezzo in conjunction with Lord, Geller, Federico and Einstein, a New York advertising agency used by IBM, created an advertising campaign based on the Charlie Chaplin tramp characture. The concept provided a friendly and uncomplicated user vision for the new computer introduction that was highly successful. During this time period the name IBM Personal Computer (IBM PC) was selected for the computer. The estimate of the market for the IBM PC was 250,000 units over a five year period. In late July the CMC gave its final approval for the introduction of the IBM PC.

9.3 ... The Original PC

The following are details of the IBM Personal Computer (IBM PC) that was introduced on August 12, 1981 in New York.

The microprocessor selected was the Intel 8088 operating at 4.77 MHz. Internally the microprocessor used the 16-bit instruction set of the Intel 8086 with

an 8-bit external data communication bus. An additional socket was provided for the later utilization of the Intel 8087 numeric coprocessor. The memory had 40K bytes of ROM and 16K bytes of RAM, expandable to 64K on the system board and to 256K by adding memory expansion cards. The ROM incorporated the 32K Microsoft Cassette BASIC interpreter and the 8K Basic Input/Output System (BIOS). The BIOS chip provided control of information transfer between elements of the hardware system.

The basic system unit had five 62 pin expansion slots for additional memory, display, printer, communication and game adapter cards. One parallel printer port, one RS-232C serial port and a built in speaker were standard. A separate 83 key adjustable tilt keyboard was connected to the computer by a six foot coiled cable via a serial port. The keyboard incorporated a numeric key pad, ten special function keys and indicator lights to display shift states. The basic system also had an audio cassette recorder connector for mass storage. With a frequency modulator an ordinary television set could be used as a monitor.

Two additional types of display were offered. A monochrome display with a Monochrome Display Adapter (MDA) for business and a color display with a Color Graphics Adapter (CGA) for home use.

The IBM Monochrome Display used an 11.5 inch green-phosphor tube. This monitor required the monochrome adapter card that had 4K bytes of on-board memory. The monitor could display 25 rows of 80 characters. The MDA system provided for 256 characters to support major languages and other items such as business graphics.

The color/graphics monitor adapter enabled connection to a RGB (red-green-blue) monitor, a color television or a black and white monitor. The adapter had 16K bytes of on-board memory and could display two modes of text and three modes of graphics. The first mode of text was 25 rows of 40 characters for color televisions and composite monitors. The second text mode was 25 rows of 80 characters for RGB monitors. The low resolution graphics mode was 100 rows of 160 pixels with 16 colors, but was not supported by IBM. The medium resolution

graphics was 200 rows of 320 pixels with 4 colors. The high resolution graphics mode was 200 rows of 640 pixels using a white-on-black image.

The basic unit had provision for two 5.25 inch floppy disk drives manufactured by the Tandon Corporation, The disks were 160K byte single-sided, soft-sectored and double density. The disk operating system was IBM PC-DOS developed by Microsoft.

The printer was an Epson MX-80 with an IBM label. The unit printed bi-directionally at 80 characters per second, with a 9 by 9 dot matrix and a choice of 12 type styles.

Three forms of BASIC were developed by Microsoft and offered by IBM: Cassette BASIC (standard), Disk BASIC and Advanced BASIC, also known as BASICA. Some of the other software available when the PC computer was released were: VisiCalc from Personal Software, three accounting programs from Peachtree Software, EasyWriter word processor from Information Unlimited Software and from Microsoft a Pascal compiler and a fantasy-simulation game called Adventure. IBM also indicated that they would offer Digital Research's CP/M-86 operating system and SofTech Microsystems UCSD p-System which included UCSD Pascal. Communications software was also available to communicate with other computers and for connection to services such as the Dow Jones News/Retrieval Service and The Source.

The basic system unit with 16K bytes of RAM and keyboard sold for $1,565. A system unit with 48K bytes of RAM, keyboard, single floppy disk drive and disk-drive adapter card was $2,235. A monochrome video display was $345 and the printer $755. The combination monochrome display adapter and printer adapter was $335. The 16K, 32K and 64K byte memory expansion cards were $90, $325 and $540 respectively.

A significant marketing decision for IBM was the use of mass merchandising by major retailers such as ComputerLand and Sears, Roebuck and Company to sell the computer. The company also set up a chain of IBM Product Centers in major cities as retail outlets. Large corporate accounts were handled by the Data Processing Division sales force. Another significant decision was

the publishing of a *Technical Reference* manual for the IBM PC that provided details of all the system specifications. This was done to facilitate the development of adapter cards and programs by outside suppliers.

The IBM PC was an outstanding success. IBM had orders for 30,000 systems from their own US employees on the announcement day. The only limiting factor on initial sales was the production capacity. Estridge had taken a group of 12 people in 1980 to a work force of 9,500 in 1984. Estridge was named division director of the entry systems business unit in January 1982, and became a vice president of the new Systems Products Division and general manager of entry systems in January 1983. By the end of 1983 IBM had sold 750,000 personal computers.

Figure 9.4: IBM PC/XT Computer.

Figure 9.5: IBM PC AT Computer.

Photographs are courtesy of International Business Machines Corporation.

9.4 ... The Following Models

IBM 9000

The IBM 9000 Instruments System Computer was announced in May 1982 and displayed at the June 1982 COMDEX show in Atlantic City. It was developed by a wholly owned subsidiary IBM Instruments Inc. and marketed as a laboratory instrumentation computer.

The computer used a Motorola MC68000 microprocessor operating at 8 MHz. The memory had 128K bytes of ROM and 128K bytes of RAM expandable to 5.2 megabytes. The unit used a 32-bit Versabus bus standard developed by Motorola. An optional expansion board could accommodate up to five Versabus cards.

The storage system could have up to 4 drives in any combination of 5.25 or 8-inch sizes. The monitor had a 12-inch green-on-black screen capable of displaying 30 lines of 80 characters with a 480 by 768 pixel resolution. The unit had a separate 83-key keyboard, a 57-key user-definable keypad on the main chassis and an optional 200 characters per second in draft mode, four-color dot-matrix printer. IBM developed the real time, multitasking Computer System Operating System (CSOS). The price varied from $5,695 to over $10,000 depending on the configuration.

The PC Series

In February 1982, three projects were initiated that would become the PC AT, PC Junior (PCjr) and the PC/XT. The PCjr was targeted at the low end of the market for home consumers. The PC/XT, with the XT representing extended technology, had a hard disk and was targeted at the professional business market above the PC. The PC AT, with the AT representing Advanced Technology would feature the new Intel 80286 microprocessor. IBM assigned the code name of Circus to the PC AT project.

The Corporate Management Committee (CMC) in Armonk approved all three projects. Product managers for each of the projects were selected to administer the development of the products.

Personal Computer XT (PC/XT)

The product manager selected to develop the PC/XT was Joseph Sarubbi. The PC/XT would be the only project of the three approved in February 1982 to stay on schedule and be released on time.

IBM introduced the PC/XT model in March 1983 in New York City. It included hard disk drive technology but utilized the same microprocessor as the PC. This new model was evolutionary. There had been expectations that IBM would utilize either the Intel 8086 or 80186 microprocessors. However once again IBM had taken a conservative approach to implementation of new technology.

The following are some details of the model. The microprocessor was the Intel 8088, the same as the IBM PC computer. Standard memory was 128K, expandable to 256K on the mother board and to 640K by adding expansion cards. The 40K of ROM contained the Microsoft Basic interpreter and Basic Input Output System (BIOS) software.

A 10 megabyte Winchester hard-disk drive manufactured by Seagate was the significant feature of the standard unit. Also included was a single 5 1/4 inch floppy disk drive, utilizing 360K byte double-sided, double-density disks. An asynchronous communications adapter was standard. The motherboard had eight expansion slots, as compared to five on the PC computer. However three slots were used by the communications adapter, floppy disk drive and hard disk drive adapters. The audio cassette recorder connector that had been on the PC was deleted. IBM also released its first RGB color monitor for both the PC and XT computers.

The cost of the standard unit with 128K of RAM, keyboard, 10 megabyte hard disk drive, 360K floppy disk drive and a asynchronous communications adapter card was $4,995. A monochrome adapter and display was $680. A color graphics adapter and color display monitor was $924. The PC XT model was a huge success and became a workhorse of the business world.

Microsoft made improvements to the operating system software for the PC/XT release. In addition to

support for the Winchester hard disk, new features such as a hierarchical file system with sub directories were incorporated into version 2.00 of the operating system. An updated version 2.00 of BASIC was also released that provided advanced support for communications, graphics and music. The generic name of this BASIC interpreter was GWBASIC (Gee Whiz BASIC). The PC-DOS 2.00 operating system and BASIC 2.00 interpreter cost $60 each.

PC Junior (PCjr)

The product manager selected to develop the PC Junior in February 1982 was Bill Sydnes. Sydnes wanted to develop a product for the consumer market that would be sold by mass merchandisers to compete with the Apple II computer at a lower price. Although it would have a somewhat limited capability compared to the PC, its performance capabilities could be improved by the purchase of upgrade features. The code name "Peanut" became associated with the new product. IBM contracted the manufacture of the computer to Teledyne Inc., in Tennessee, a company founded by Arthur Rock and Henry Singleton.

In the summer of 1983, Sydnes resigned from IBM due to differences of opinion with Don Estridge on marketing and other aspects of the PC Junior development. He then joined the Franklin Computer Corporation as vice president for product development. The new manager would be Dave O'Connor. However, O'Connor had inherited design and production problems that delayed the release date from that initially targeted.

The PC Junior (PCjr) was introduced in November 1983 with high expectations as a low-priced home computer. However customer deliveries of the computer did not occur until early 1984. The PCjr had three separate pieces of hardware: the system unit, power transformer and cordless keyboard. Two configurations of the PCjr were released, a standard model and an enhanced model. Both models used the Intel 8088 microprocessor operating at 4.77 MHz with 64K bytes of ROM. The system unit had three expansion slots for 64K bytes of additional memory, a floppy disk drive and a 300-bps

(bits per second) internal modem. An expansion bus connector was also provided that could be used to connect a parallel printer. The detached keyboard had 62 keys and used an optical infrared light transmission technology to link between the keyboard and the system unit. The keyboard did not have a numeric key pad or any function keys.

The standard model had 64K bytes of RAM, expandable to 128K and a base price of $669. The enhanced model had 128K bytes of RAM, a capacity to display 80 columns of text and a half-height 5.25-inch, 360K byte double-sided floppy disk drive manufactured by Qume. The enhanced model had a price of $1,269. An IBM Color Display monitor was available at a price of $680.

A new version 2.1 of PC-DOS with a cost of $65 was released for the PCjr. However the memory requirements of the operating system limited the number of application programs that would run on the computer. The system was compatible with the IBM Personal Computer (IBM PC). No other operating systems were offered for the PCjr. The standard model had Cassette BASIC in ROM and an enhanced Cartridge BASIC was available for $75.

In early 1984 sales for the PC Junior were in trouble and production was stopped in June to reduce inventory. The high price, spongy-to-touch "chiclet" style keyboard, limited memory and storage capabilities had resulted in poor customer acceptance.

An advanced version of the PC Junior was introduced in July 1984. Various improvements to enhance the performance were made, such as increased memory and a new typewriter-style keyboard. Then an intensive promotional campaign was launched in the late fall of 1984 to increase lagging sales. However after the holiday season and the end of the promotional campaign sales fell off again. It had been a market failure that resulted in the computer being discontinued in March 1985.

PC/XT 370 and 3270 PC

The Information Systems Division that produced mainframe computers, introduced the PC/XT 370 and 3270 PC computers in October 1983. These products were designed to be a link to IBM mainframe computer systems.

The PC/XT 370 also had a designation of 5160 Model 588. This computer was an enhancement of the PC/XT computer, with three additional boards to emulate IBM System/370 mainframe computers and to function as an IBM 3277 display terminal. In addition to the standard PC/XT Intel 8088 microprocessor, one of the additional boards had three microprocessors. One of the three microprocessors was an Intel 8087 for floating-point arithmetic functions and the other two microprocessors were based on the Motorola MC68000 for emulation of System/370 instructions. The second additional board extended memory by 512K to 768K bytes. The third board provided emulation of the IBM 3277 display terminal. The computer also had one 360K byte floppy disk drive and either a 10 or 20 megabyte hard disk drive. The PC/XT 370 cost $8,995 with a 10 MB hard disk and $11,690 with a 20 MB hard disk. A software package named VM/PC (Virtual Machine/Personal Computer) was required at a cost of $1,000 to interface with a System/370.

The IBM 3270 Personal Computer also had a designation of 5371 with Models 12, 14 and 16 depending on the configuration. The computer combined a standard IBM Personal Computer with an IBM 3270 display terminal. The base computer had 256K bytes of memory, expandable to 640K and a 122-key keyboard with all the keys of a standard PC and a 3270 terminal. A 3270 PC Control Program enabled the computer to concurrently access up to four programs on a host computer, two “notebook” data-storage transfer areas and a PC-DOS application program. The Control Program also allowed a user to define up to seven windows to monitor the programs being accessed. The user could select the color, position and size of any window. A base 3270 Personal Computer with 256K bytes of memory cost $4,130 and the 3270 PC Control Program $300.

Portable PC

The Portable Personal Computer (PC) was introduced in February 1984. The unit measured 8 by 20 by 17 inches and weighed 30 pounds. With this weight, it would become known as a "luggable." The portable used an Intel 8088 microprocessor operating at 4.77 MHz, 40K bytes of ROM and 256K bytes of RAM, expandable to 640K. The unit had one 5.25 inch half-height 360K floppy disk drive with provision for a second drive. A 9 inch amber monitor was built into the unit, seven expansion slots were provided (two used by the floppy disk drive and monitor adapter) and the cost was $2,595. However Compaq had an earlier and better portable which sold at virtually the same price which adversely affected IBM sales and market acceptance.

Personal Computer AT (PC AT)

Two models of the PC AT (Advanced Technology) were introduced in August 1984. This was a significant delay from the release date targeted in February 1982. The variations were a Base model with less memory and no hard disk drive and an Enhanced model.

The microprocessor was the more powerful 16/24-bit Intel 80286 operating at 6 MHz with an optional Intel 80287 Math coprocessor. The permanent memory (ROM) was 64K. The user memory (RAM) was 256K bytes on the Base model and 512K bytes on the Enhanced model. With additional expansion cards, the memory could be expanded to three megabytes on both models.

Both models had one half-height 1.2 megabyte floppy disk drive with provision for a second drive. The Enhanced model had a 20 megabyte hard disk drive. Hard disk drives with up to 40 megabytes capacity could be installed in both models. The models contained eight expansion slots for additional adapter cards. The keyboard was an enhanced version of the PC keyboard. Microsoft released Version 3.00 of PC-DOS and XENIX 286 operating systems for the new models.

The Base model cost $3,995 and the Enhanced model $5,795. The computers were intended as replacements for the XT computer. IBM stated that the computer was designed to be a multitask, multi-user computer.

Problems with the hard disk drive resulted in delayed deliveries of the computer. However the AT computer had good reviews and became a up-market replacement for the XT. The operating speed of the PC AT microprocessor was increased to 8 MHz in 1986.

PC RT

IBM approved development of a workstation computer using the RISC (Reduced Instruction Set Computing) ROMP (Research Office products MicroProcessor) processor in 1983. G. Glenn Henry was the manager of hardware and software system development. The project had the code name of Olympiad and became the PC RT computer.

The PC RT workstation was introduced for work such as CAD (Computer Assisted Design) in January 1986. It utilized a high performance (approximately 2 million instructions per second) IBM ROMP 32-bit RISC processor. An Intel 80286 microprocessor was used as a coprocessor to facilitate program and user interface with the PC family of computers. A Memory Management Unit (MMU) extended the 32 bit processor address to a 40 bit virtual address to provide advanced virtual storage capabilities. The computer had one megabyte of memory, a 1.2 megabyte floppy disk drive and a 40 megabyte hard disk drive. It utilized an AIX (Advanced Interactive Executive) operating system based on AT&T's UNIX System V operating system. The PC RT workstation cost $11,700.

The workstation was not received well due to poor performance as compared to competitive products from Apollo and Sun Microsystems. This resulted in a new project with the code name of RIOS being started in 1986 to develop a new more powerful workstation that would become the RISC System/6000.

PC Convertible

IBM introduced the 5140 PC Convertible (code-named Clamshell) laptop computer in April 1986. The computer name was selected because it could be used as a portable or as a desktop with an expansion box and a larger monitor. The unit weighed 12 pounds and featured an Intel 8088 microprocessor, 256K bytes of memory, two

3.5 inch 720K byte floppy disk drives and a 25-line liquid crystal display (LCD) monitor. The computer cost $2,995. However, the product was not successful due to the use of an older processor, problems with the LCD display and the early use of 3.5 inch floppy disk drives.

PC/XT Model 286

The PC/XT Model 286 was introduced in September 1986. It featured the Intel 80286 microprocessor, 640K bytes of memory, one 1.2 MB floppy disk drive, a 20 megabyte hard disk drive and cost $3,995. However the late introduction and pricing relative to other competitive products resulted in poor sales.

PS/2 Series

The Personal System/2 (PS/2) family of personal computers was introduced in April 1987 (except the Model 25). The "2" in the PS/2 product name, denoted a second generation of personal systems. The Models 50, 60 and 80 had a new architecture with a proprietary Micro Channel Architecture (MCA) bus. MCA was a 32-bit multitasking bus that did not support the previous expansion cards for the PC computer. IBM's intent was to regain control of the open architecture and force clone manufacturers to obtain a MCA license. The preceding models also utilized a new video standard called VGA (Video Graphics Array) that had improved screen resolution. The new OS/2 operating system developed by IBM and Microsoft was also announced for use with the computers.

The following are some details of the various PS/2 models introduced in April. The Model 30 was available in two configurations and featured an Intel 8086 microprocessor operating at 8 MHz, 640K bytes of memory and the PC XT bus. The Model 30-002 had two 720K byte floppy disk drives and cost $1,695. The Model 30-021 had one 720K byte floppy disk drive, a 20 megabyte hard disk and cost $2,295. The Model 50 had an Intel 80286 microprocessor, one megabyte of memory, 1.44 megabyte floppy disk drive, 20 megabyte hard disk drive and cost $3,595. The Model 60 featured an Intel 80286 microprocessor, one megabyte of memory, 1.44 megabyte

floppy disk drive, 44 megabyte hard disk drive and cost $5,295. The Model 80 was available in three configurations using the Intel 80386 microprocessor and a 1.44 megabyte floppy disk drive. The Model 80-041 had one megabyte of memory, a 44 megabyte hard disk drive and cost $6,995. The Model 80-071 had two megabytes of memory, a 70 megabyte hard disk drive and cost $8,495. The Model 80-111 had two megabytes of memory, a 115 megabyte hard disk drive and cost $10,995.

The Model 25 was a low cost computer, introduced for business and educational users in August 1987. It featured the Intel 8086 microprocessor, 640K bytes of memory, a 720K byte floppy disk drive and cost $1,395.

A portable version of the PS/2 series, the PS/2 P70 was announced in May 1989. At a weight of 20.8 pounds it would now be called a "luggable." It used an Intel 80386 processor, had 4 MB of RAM (expandable to 8 MB), 120 MB of disk storage, MCA bus and a high-resolution plasma display. The PS/2 P70 received good reviews and had good sales.

The PS/2 series of computers were not well received in the marketplace. IBM had focused on the older Intel 80286 microprocessor rather than the latest 80386 chip. Also the incompatibility of the new MCA bus with old add-on cards, the late release of the new version and general poor acceptance of the OS/2 operating system, all contributed to sales below expectations. The MCA bus was not supported by the industry and became a strategic mistake for IBM.

9.5 ... Software

OS/2 and Microsoft

By the end of 1984, Bob Markell who was a vice president of software and communication products at IBM, had created a task force to determine a suitable operating system for future products. IBM had been working on its own operating system called CP-DOS that would be used for the 286 microprocessor initially and the 386 microprocessor later. IBM also wanted a system that incorporated multitasking, so a user could run more

than one application at the same time. Company management had mixed aspirations to develop the new operating system internally independent of Microsoft. However, discussions were held with Microsoft regarding the new system that culminated in the signing of a joint development agreement in June 1985.

The joint development efforts following the agreement led to numerous difficulties between the two different types of corporate styles. IBM was attempting to satisfy many different corporate demands and were adding an increasing number of personnel to the project to maintain the completion schedule. Microsoft was accustomed to software development with a small group of talented programmers. However, Microsoft had conceded final responsibility for the software design to IBM.

Another significant decision that would create subsequent difficulties was the use of assembler language to program the new operating system. This choice and a focus on the Intel 80286 microprocessor for the PS/2 series of computers would add to the complexity and portability of the new system.

In mid 1986 a new concept called Systems Application Architecture (SAA) was approved for implementation. This system provided a common software development environment between the different IBM hardware levels, from personal computers to mainframes. However it also resulted in additional complexity to the software. Also, a new graphical user interface that would be called Presentation Manager, would be developed by the graphics software group in Hursley, England.

The company was also now working on an Extended Edition of the new operating system that Microsoft was excluded from participating in. The Extended Edition included communications and database services. IBM also planned to introduce a set of office applications that would be called OfficeVision for the Extended Edition.

During this period new personal computer hardware was also being developed. The new hardware would have a different bus concept called Micro Channel Architecture (MCA) and an Advanced Basic Input/Output System (ABIOS). With strong enforcement of applicable patents this was going to be IBM's strategy to combat the clones.

IBM announced the new operating system called OS/2 with the Personal System/2 computers in April 1987. A Standard and Extended Version 1.0 were released in November. However it did not include the Presentation Manager software that was now promised for October 1988. Only a few application programs were available. The program cost $325 (twice as much as DOS), required additional memory and storage as compared to DOS, and was not well received.

In May 1988, IBM joined the Open Software Foundation (OSF) that was established to develop a unified UNIX operating system for different platforms. Then IBM purchased a license for the NeXTSTEP operating system from NeXT Computer, Inc. IBM was intent on establishing optional operating systems to OS/2 and PC-DOS.

IBM released Presentation Manager as part of OS/2 Version 1.1 in October 1988. The graphical user interface had been developed by IBM in Boca Raton, Florida, IBM laboratories in Hursley, England and by Microsoft. The graphics were well received. However, the lack of application programs and device drivers, the requirement for additional memory and the pricing adversely affected sales.

During 1989, James A. Cannavino, the new head of the Entry Systems Division began to question the viability of OS/2 and the relationship between IBM and Microsoft. His concerns related to the low acceptance of OS/2, the income Microsoft derived from the PC disk operating system software and the potential impact of a new version of Windows being developed by Microsoft. Software vendors were also expressing concerns regarding the future market share of OS/2 and their significant investments in application programs for the new operating system. Cannavino had even recommended that IBM drop OS/2 in March. However, corporate management rejected his recommendation and instructed him to “build a world class operating system.” Cannavino had discussions with Bill Gates and a tenuous agreement was announced at the fall COMDEX show that appeared to support each companies system. However Cannavino had been committed to OS/2, not Microsoft Windows. In late

1989, Version 1.2 of OS/2 was released, however sales of the OS/2 operating system were still well below expectations.

Other Software

Displaywrite was a word processor developed by IBM for the DisplayWriter workstation in 1980. It was one of the few relatively successful application programs written by IBM.

TopView was an IBM character-based user interface that was announced in August 1984. It incorporated windows and multitasking that enabled the running of multiple programs with the ability to switch between them. It was not released until January 1985 and cost $149. However, it was slow, required a lot of memory and did not have a graphical interface. Due to poor acceptance it was withdrawn from the market in June 1987.

IBM released PC Network in conjunction with Microsoft PC-DOS Version 3.1 in March 1985. It was designed to connect the PC-family of computers in a local-area network (LAN).

A software group was formed by Joseph M. Guglielmi in 1987 to develop an office system that would facilitate the communication and sharing of information and software such as databases, desktop publishing, electronic mail, spreadsheets and word processors. The application software used the name OfficeVision for its products. David Liddle who had worked at Xerox PARC, was a principal in the development of the OfficeVision suite of software released in June 1989. However, it was not graphically oriented, priced too high and was not successful. IBM essentially disbanded the software group around 1992.

IBM created a Desktop Software division in 1988. It was established to market personal computer software by IBM and other companies using the IBM logo. However it was not successful either and was terminated around 1992.

9.6 ... Corporate Activities

1980 and 1981 are significant years due to the approval and release of the IBM Personal Computer (see Sections 9.2 and 9.3). John Opel became the chief executive officer of IBM in January 1981.

In January 1982, the Department of Justice withdrew its antitrust suit against IBM. In late 1982, an executive search firm for Apple Computer contacted Don Estridge as a potential candidate for the position of president. However Estridge declined the offer.

Then in December 1982 IBM acquired 12 percent of Intel Corporation stock for $250 million. Intel was having financial problems due in part to Japanese competition in memory chips. IBM made the stock purchase to provide a secure source for its microprocessors and to maintain the viability of domestic chip manufacturing equipment suppliers. This also resulted in Intel licensing the manufacture of the chip to others. IBM now had a second source for its microprocessors. IBM also built a new highly automated factory to mass produce the PC computers.

John Opel became chairman of the board and John F. Akers president of IBM in February 1983. In August, the Personal Computer unit at Boca Raton, Florida became part of a new Entry Systems Division (ESD) and Don Estridge was appointed president of the division. The new divisional organization consolidated major facilities at Boca Raton and Austin, Texas. It also had worldwide responsibilities for product development and management including plants in Greenock, Scotland and Wangaratta, Australia. Joe Bauman became vice president for manufacturing, Joseph Sarubbi director of technologies and Dan Wilkie director of quality assurance and technology for the new division.

Starting in 1983, the company began implementing the traditional bureaucracy at the Entry Systems Division. The freedom enjoyed by the original IBM PC group was coming to an end. H. L. Sparks and James D'Arezzo left IBM and joined Compaq Computer Corporation in 1983. Then in January 1984, Estridge was made a vice president of IBM.

Responsibility for retail dealer sales of all PC products was moved from the Entry Systems Division to the corporate national sales organization in January 1985. John Akers became the chief executive officer in February. In March, Estridge was promoted to vice president of worldwide manufacturing for IBM and William Lowe became president of the Entry Systems Division. Then in a tragic plane crash, Don Estridge was killed at the Dallas-Fort Worth, Texas airport in August. In late 1985, Dan Wilkie resigned from IBM to become president of another company.

Joe Sarubbi retired from IBM and joined the Tandon Corporation as a senior vice president of manufacturing in February 1986. In the spring of 1986, the number of IBM employees peaked at 407,000. During 1986, IBM concluded a technological exchange agreement with the Intel Corporation (See Section 8.4). In June John Akers became chairman of the board, a year that saw significant reductions in IBM's financial performance.

In 1987, it appeared that the financial difficulties encountered in 1986 would continue. Akers initiated the formation of task forces to evaluate the problem. This resulted in the closure of a parts distribution facility and a reduction of 10,000 employees by early retirement and severance package options. IBM also sold the remaining shares of Intel Corporation stock that the company purchased in 1982.

Akers announced a further reorganization to delegate more decision making down to lower levels in the company organization in January 1988. Then in December William Lowe left IBM and joined the Xerox Corporation. He was replaced by James Cannavino who inherited an extremely difficult business situation in the Personal Computer group. The group had lost 1.4 billion dollars in 1998, the PS/2 computer was not selling, the MCA bus and the OS/2 operating system were not accepted by either customers or the industry.

In March 1989, Cannavino made a number of recommendations to the IBM Board to correct the business situation of the PC group. Some of these recommendations were: to significantly reduce the company's focus on the desktop business, increase their participation in the

portable and server segment of the business and drop the OS/2 operating system. However, the Board wanted to keep IBM in the PC business, retain the OS/2 operating system and review the relationship with Microsoft. Cannavino was also concerned about reducing IBM's dealer and sales organization costs, and competition from direct sellers such as Dell and Gateway.

In May, Jack D. Kuehler became the president of IBM and Cannavino was promoted to general manager of the Personal Computer group in mid 1989. Around this time Cannavino selected Bob Lawten to analyze IBM's efforts in the portable computer segment of the market. After discussions and agreement with Bill Gates at Microsoft, Cannavino made a recommendation that IBM purchase forty percent of Microsoft. This would motivate both companies to make the relationship work. However, this proposal was rejected by the IBM Board. The reorganization and changes implemented by Cannavino during 1989, resulted in a change from a loss of 1.4 billion dollars in 1988 to a profit of 1.2 billion dollars in 1989.

Figure 9.6: James A. Cannavino.
Photograph is courtesy of IBM Corporation.

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