The IBM Personal Computer: A Software-Driven Market

Edward Bride

Instead of designing the fastest or most powerful computing platform based on new technology, IBM chose the fastest path to market, creating its product from already available parts and signing up with a community of independent software vendors to provide the operating system, tools, and a library of applications.

It's common for new technology to be so impressive that it both establishes a market and becomes the standard in that market. More typically, a latecomer may set the standard in terms of market acceptance, even if its newer technology isn't superior. In the consumer video recording area, for example, VHS became the standard, displacing the Beta technology many people considered superior.

Then there's personal computing. Introduced in August 1981, the IBM system wasn't the first personal computer. "Nor was it the most advanced," notes Mark Dean, a member of the original IBM PC design team. But shortly after its launch in 1981, the IBM PC "became the leading platform in the revolution that brought computing out of the glass house and into daily life." (www.ibm.com/ibm100/us/en/icons/personalcomputer)

It's perhaps a historical irony that the brand of microcomputer which became "the standard" for business computing came about by throwing past practice to the winds. Instead of designing the fastest or most powerful computing platform based on new technology, the standard bearer, IBM, chose the fastest path to market, creating its product from already available parts and signing up with a community of independent software vendors (ISVs) to provide the operating system, tools, and a library of applications.

Why did this happen, in the face of IBM's proud tradition of innovation and proprietary technology?

THE PC FRONTIER

As thoroughly documented elsewhere, IBM was under pressure to deliver a product in a year, and that wasn't something likely to be achieved in a lab in a huge company like IBM.

Less than five years before the introduction of the IBM PC, the "microcomputer"—the term personal computer hadn't yet emerged—was something that required either a kit or special skills and training to assemble. Brand names like Altair and Heath weren't uncommon on hobbyists' gift lists, but desktop computers, available from companies like Cromenco or Commodore, were uncommon in business. In some companies, a rare if adventurous businessperson might have an accounting application from Peachtree or Great Plains, running on machines based on the CP/M operating system.

It wasn't IBM that dramatically opened this new frontier, but Apple Computer. Starting in mid-1978, the Apple II computer was often equipped with VisiCalc, a revolutionary business spreadsheet product designed by Dan Bricklin and Bob Frankston, and then available from Personal Software, Dan Fylstra's software publishing company.

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VisiCalc changed the way financial analysts operated. I learned of this new tool while working in the marketing department at Hewlett-Packard, in between editorial jobs at *Computerworld* and *Software Magazine*. Instead of working with pencil and paper to develop our annual budgets, we would ask the finance department to use the Apple II and this new type of automated spreadsheet to help make our calculations. Under the watchful eye of the "owner" of VisiCalc, marketing would give and finance would take, but the process still was easier than pre-Apple.

I hadn't read anything about Apple or VisiCalc at *Computerworld*, perhaps largely because the machines were so low in price that they were below the threshold for capital expenses, and weren't visible to either finance or data-processing executives. These desktop computers could be acquired by individuals whose budgets were reviewed at their own departmental level, outside the scrutiny of data-processing departments. Somehow, our finance department knew about this terrific new tool and acquired an Apple II for its own use. The as-yet-unnamed PC market had really been born.

It doesn't matter whether IBM coveted a piece of Apple's pie or simply recognized that the market could be significant for business computing based on the microcomputer platform. These machines were powered by a processor so small that the iconic ex-IBMer Herbert R.J. Grosch once referred to it as "a bump on a wire."

SURVEYING THE MARKETPLACE

By 1980, Apple II and VisiCalc had become hot items, and the market was taking off. It became apparent to IBM that the dominant force in mainframe computing could only become "the IBM" of this market if it launched its product within a ridiculously short timeframe. Around mid-1980, the IBM Corporate Management Committee gave William P. Lowe, systems manager in the Entry Systems Division (part of the General Systems Division) facility at Boca Raton, Florida, one year to accomplish the task. The person who led the charge was Philip D. (Don) Estridge, lab director at the Boca Raton facility.

The timeframe wasn't imposed from out of the blue but actually suggested by Lowe himself. According to the IBM archives:

> … Early studies had concluded that there were not enough applications to justify acceptance on a broad basis and the task force was fighting the idea that things couldn't be done quickly in IBM. One analyst was quoted as saying that "IBM bringing out a personal computer would be like teaching an elephant to tap dance." During a meeting with top executives in New York, Lowe claimed his group could develop a small, new computer within a year. The response: "You're on. Come back in two weeks with a proposal." (www-03.ibm.com/ibm/history/exhibits/pc25/pc25_birth.html)

Burton Grad and Mike Uretsky, who played leading roles in a study that evaluated the business prospects for microcomputers for IBM in 1979, recalled how they came to this position after at least two other "PC" studies. Uretsky, who started the information systems department at New York University and has since retired from NYU's Stern School of Business, was a consultant under contract to IBM. His small consulting company's assignment was to do preliminary market research on possible demand for a small computer. Grad had been an IBMer, and in fact was on the team that helped implement IBM's 1969 "unbundling" of hardware and software pricing. Grad had left IBM and was retained to work on this market research study.

Grad and Uretsky actually conducted two of what could best be called "covert projects" for IBM. Commissioned in 1979 to explore the receptiveness of CIOs, customers, and the third-party ISV community to a new player in the microcomputer market, they were forbidden to disclose who their client was.

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"Apple was a toy until VisiCalc came along," Uretsky said. That software product was the real revolution, in the sense that "a really inexpensive program could allow you to do business processes the way you thought about them, the way you told a secretary or an assistant to do some analyses for you," he explained. In the mainframe market, customers purchased computing power as if it were a utility, but "people bought Apple computers so they could get access to the software. It became a software-driven market. That hasn't changed."

Apple and VisiCalc were already well-established when the study was launched, and VisiCalc access was part of the plan from the outset. There would need to be a VisiCalc translator, or a VisiCalc equivalent. "That was a given, a constraint," said Uretsky. "We knew enough to know that that market was software-driven." And, since this would be sold to a business audience, not only would it be software-driven, but "a critical mass would be required to succeed, and that would open up the market for a lot of the smaller companies." The people in IBM felt they had a leg up on recognizing and reaching the market, as the company was already selling office equipment to big and medium-size companies: typewriters, dictating machines, and of course computers; it was thought that this corporate presence would equip IBM's sales force to make bulk sales. "We

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knew that the credibility of IBM would carry over to any small computer that IBM might want to sell en masse, so that was the most likely path to travel," Uretsky observed.

The numbers regarding the potential market demand were all underestimated, Uretsky recalled, but for a good, or at least an understandable, reason. The consulting agreement's confidentiality clause ensured that no companies being interviewed would know that this was a study being done for IBM. "Apple was out there, and there were some other toys," he noted. CIOs were asked if they would buy a small computer with business software. "There would have been a different response if we had asked that question in the context of the provider being IBM, the company from which people purchased typewriters, dictating machines, punch-card equipment, and other business equipment."

Plain and simple: to be nonproprietary, IBM couldn't control the OS.

The interviewees seemed interested, or at least curious, but there were reservations. For these machines to be viable in a corporate environment, the prospective buyers would need to purchase them in quantities that would drive the machine to become a standard, and that meant in the thousands. To make purchases of that magnitude, the buyer would need confidence that the vendor had a long life expectancy, some longevity, and a current track record.

Since the survey didn't identify IBM, the responses had a very conservative bias, Uretsky indicated. "We knew the bias was there, and in which direction the bias was. One of the internal discussions was: how to present the information to the Corporate Management Committee to go forward, in a mind-set of mainframes." That is, in pulling together reasonable numbers on sales projections, even if the estimates were scaled back, there was still skepticism about any ability to predict strong sales of that many boxes.

"IBM looked at this potential from a technical and business standpoint for at least a three-year period. They were trying to understand what the market was, and what technologies they had that would move them into this area," explained ex-IBMer Grad. "From very early on, all of IBM's hardware and systems software, specifically for the smaller company market with System/3, System/32, and so on, was all based on proprietary technology. The operating system was proprietary; and the applications were developed by IBM: manufacturing control, accounting, everything."

IBM felt that its smaller machine offerings needed to include applications software because the customers wanted to buy solutions for their problems and had little programming expertise, and they had no interest in acquiring it, Grad said.

The covert study team wasn't looking at the Apple II as competition, Grad avers, largely because of that computer's technical limitations. "We were looking at using independent software packages like Peachtree or Great Plains for accounting, which had trouble running on hardware with limitations such as Apple's, with its uppercase alpha characters and limited line size." Venture capitalist Ben Rosen had been pushing Apple because of the availability of VisiCalc, which had, indeed, established that microcomputer as a business machine.

Grad and Uretsky pointed out that this was a new market, not just for IBM but for technology in general, both for individual users and business analysts. They advised IBM not to go proprietary with its systems and applications software because "we knew that in order to succeed, IBM would need a lot of third parties writing software for the new system," Grad recalled. Plain and simple: to be nonproprietary, IBM couldn't control the OS.

CHOOSING THE OS

By running on a standard platform, IBM wouldn't have to fight the battle of convincing third-party application writers to convert to some proprietary IBM system. The 1979 study concluded that essential elements must include a commonly available operating system, preferably already a standard, and that the company would need third parties in that small-systems market. "We recommended that IBM rely heavily on these third parties, and not try to build all the software themselves," Grad said.

IBM agreed that it didn't want a proprietary OS. "The only way to accomplish that was to allow the operating system vendor to put it onto any platform they wanted," Grad noted. "No matter who IBM selected, if it was going to be nonproprietary, it had to be available anywhere.

"That was heresy, to some extent," Grad added. But IBM agreed with this recommendation and sought to find an independent OS.

So, which OS? The choice was clear. It should be CP/M, the established standard from Digital Research Inc. (DRI), previously known by the rather pretentious name Intergalactic Digital Research.

How did IBM end up with Microsoft? There are several versions of how the IBM OS came to be the new DOS instead of the already-established CP/M. (IBM would receive much criticism for its business decision to not make PC-DOS proprietary and to let Microsoft have the right to license MS-DOS to other microcomputer manufacturers, Grad reflected.)

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One way or the other, DRI's reticence or unavailability—or whatever the motivation not to do business with IBM—brought the IBM software team, headed by Jack Sams, back to Microsoft.

According to Mark Dean:

> Jack Sams was the engineer in charge of software development for the prototype. He had worked on the IBM System/23 [also known as Datamaster], and had spent a year building the Basic-compiler for it, pushing the product behind schedule. He didn't want to repeat the same struggle with the new microcomputer, so he decided to license most of the software from an outside company. Sams met with Bill Gates to evaluate whether Microsoft could handle the task of writing a Basic compiler for the IBM PC. This led to his recommendation to William Lowe that they use Microsoft software in the final product. In addition, when he was unable to make a deal with Intergalactic Digital Research for the operating system, Sams and his team turned to Microsoft. This led to the development of an operating system released by IBM as PC-DOS and by Microsoft as MS-DOS. (www.ibm.com/ibm100/us/en/icons/personalcomputer/team)

The folklore includes at least three different stories of why DRI didn't get the deal, chronicled in various forms, including Robert X. Cringely's colorful *Accidental Empires: How the Boys of Silicon Valley Make Their Millions, Battle Foreign Competition, and Still Can't Get a Date* (Addison-Wesley, 1992). In Cringely's version, CEO Gary Kildall was flying his plane and didn't or wouldn't come to the meeting; in other versions, lawyers didn't want Kildall to sign a nondisclosure agreement with the big company, or personalities steered them away from doing business with IBM. From a historical viewpoint of assessing the impact of third-party parts, the correct version of the story doesn't matter very much: the key decision was to go to an independent OS provider, rather than which ISV would provide it.

The fact was that IBM was ready to make a deal; they had already signed up with Microsoft for the Basic language, and were ready to make the same sort of arrangement with DRI for CP/M on the new machine. Would DRI have become "a Microsoft," in terms of innovation and industry power? We'll never know for sure, but the point is that to be nonproprietary, IBM couldn't control the OS.

Microsoft had just been formed in 1975, and didn't actually incorporate until June 1981, less than two months before the PC was introduced. Perhaps formally incorporating was a requirement by IBM to continue doing business with these young developers and entrepreneurs.

Once they made that decision, IBM could go to the ISV community and make the promise of offering a nonproprietary platform, mitigating any concerns that IBM might not have the customary market success with microcomputers that it had in mainframes; that is, that it might not actually become "the IBM of the personal computer world."

As the IBM PC developed a larger ISV following in the early 1980s, overcoming the technical deficiencies and limited memory of the initial hardware product became more important. One player not to be forgotten is Lotus Development Corporation, another significant spreadsheet company founded by Mitch Kapor and backed by Ben Rosen. The industry in the 1980s was largely trying to work around the hardware limitations, recalled historian Thomas Haigh, of the University of Wisconsin-Milwaukee. Lotus' Jonathan Sachs originally wrote 1-2-3 in assembly language, Haigh said, giving performance benefits but also resulting in later problems in porting to other platforms.

IBM ANNOUNCES THE PERSONAL COMPUTER

From a 12 August 1981 press release by the IBM Information Systems Division:

Software for Business and Home

"We intend the IBM Personal Computer to be the most useful system of its kind," [C.B. Rogers, Jr., IBM vice president and group executive, General Business Group] said. "Besides making it easy to set up and operate, we are offering a program library that we expect will grow with the creativity of the personal computer users."

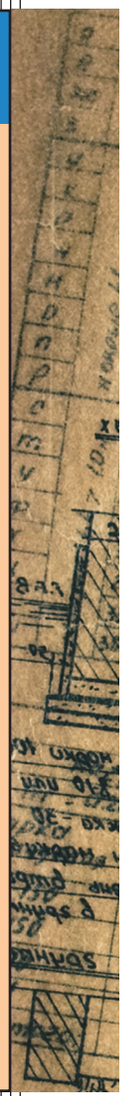
Rogers said IBM has established a new Personal Computer Software Publishing Department for the system. It will publish programs written by IBM employees working on their own time and those accepted from independent software companies and outside authors.

Program packages available for the IBM personal computer cover popular business and home applications. For example, EasyWriter will store letters, manuscripts, and other text for editing or rapid reproduction on the printer. Businesses can use General Ledger, Accounts Payable, and Accounts Receivable by Peachtree Software, Inc. to generate balance sheets, track accounts and automatically print checks.

VisiCalc is available for applications ranging from financial analysis to budget planning. Microsoft Adventure brings players into a fantasy world of caves and treasures.

Advanced Operating Systems

IBM, in conjunction with Microsoft, Inc., has adapted an advanced disk operating system to support IBM Personal Computer programs and software development. It has also contracted with Digital Research, Inc. and SofTech Microsystems, Inc. to adapt the popular CP/M-86 and UCSD p-System to the Personal Computer. These two systems should provide users with the opportunity to transfer hundreds of widely used applications to the IBM Personal Computer with minimal modifications.



DOS LIMITATIONS

Because the IBM PC became an industry standard, it shaped the experience of users of its far more powerful machines for decades to come. Overcoming its initial limitations was difficult. Instead, new additions had to be built on top of and around the PC's original architecture. Haigh pointed out that the original extended-memory standard was developed by three companies and nicknamed LIM

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(Lotus-Intel-Microsoft), so Lotus could have a decent-size spreadsheet. IBM eventually acquired Lotus in 1995.

From a computer science standpoint, "DOS was a terrible OS," said Haigh, adding that "it was successful because of its backward compatibility." DOS was originally supposed to be "PC-like" but not totally compatible at the BIOS level, he recalled. By 1994, 32-bit Pentium-based personal computers running Window 3.11 were hundreds of times more powerful than the original PC, but were still limited by its original hardware design. Haigh noted that the design was "far uglier than a clean-sheet alternative would have been," but the machines had evolved to maximize backward compatibility with the original PC running DOS underneath Windows, and relying on a creaky system of segmented memory management. "If there were a properly designed modern OS," said Haigh, "the niche for a product like Quarterdeck Extended Memory Manager (a third-party utility used to optimize free memory within the PC's original 640-KB limit), would never have existed. But with the power of the whole collective bundle of users and standards and providers, everything could move along incrementally, even with the inherent limitations."

A media frenzy ensued after introduction of the IBM 5150, which quickly became known by its more familiar name, the IBM Personal Computer.

Terrible or not, DOS wasn't a very ambitious OS, especially compared to Unix or Mac. In fact, it wasn't even significantly more ambitious than CP/M, commented Haigh. He believes this simple start impacted the structure of the software industry. For example, "WordPerfect's developers had to write their own printer drivers and graphics drivers to support new devices, rather than being able to rely on operating system capabilities." This type of tuning and feature creation made a difference in terms of the kind of resources required to develop an application. "Contrast this with software development effort for today's iPhone or iPad apps, where the OS does so much more for them. Today, there are so many more tools in the OS."

PC MEDIA FRENZY

A media frenzy ensued after introduction of the IBM 5150, which quickly became known by its more familiar name, the IBM Personal Computer. The market took on a consumer persona, spurred by the fact that IBM established its own retail stores and teamed up with both Sears and the ComputerLand chain. Suddenly, IBM PCs were everywhere.

New PC-related publications seemed to debut every week. In one year in the mid-1980s, in fact, 55 new publications came onto the scene; the next year, 55 publications ceased operations—some of them the very same ones that had premiered the previous year. Magazines like *BYTE* and *Creative Computing* played an important role, exchanging information and even printing program listings and circuitry diagrams. Review-oriented media such as *PC Magazine* looked like the Manhattan telephone directory. Editors were so competitive to get their hands on information about new products that they would often review prerelease versions, or in fact write about products that weren't even deliverable. This practice became so common that a name was coined for announced but incomplete software: "vaporware." In one infamous example, a publication declared the multifunction product Ovation to be "product of the year," yet it never even shipped.

Now, more than 25 years later, the term and the practice are memorialized in a Wikipedia entry:

> "Vaporware" was coined by a Microsoft engineer in 1982 to describe the company's Xenix operating system, and first published by computer expert Esther Dyson in 1983. It became popular among writers in the industry as a way to describe products they felt took too long to be released. Vaporware first implied intentional fraud when it was applied to the Ovation office suite in 1983; the suite's demonstration was well-received by the press, but was later revealed to have never existed. (http://en.wikipedia.org/wiki/Vaporware)

(See also E. Bride, "The Media Are the Message: 'The Influencers'," *IEEE Annals of the History of Computing*, Oct.-Dec. 2006, pp. 74-79.)

The staff of one of the mainstream media computer publications spent nearly an entire editorial retreat discussing whether they should even be covering the PC. With its audience being in the IT departments of large corporations, it was thought that the PC wouldn't be a serious contender in enterprises until mainframe connectivity became a reality. Of course, it was just a matter of evolution and time.

Mike Uretsky, having done some of the market research, as well as putting together some of the presentations for IBM's Corporate Management Committee, saw some IBM projections as well. And with regard to the software: "… none of us saw the magnitude of what ultimately evolved. Having said that, we knew that you needed a critical mass of programs, and that they had to be business-related."

EARLY SOFTWARE EFFORTS

Other than VisiCalc, much of the early software effort was "a debacle," recalled Uretsky. "The original attempt at an OS was to port down a mainframe OS, from a mini down to a PC. That was never going to work, for technical reasons such as memory limitations. We would tell people like [IBM vice president of sales and marketing] Buck

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Rogers to find a couple of kids with a garage, which indirectly led to a conversation between him and Bill Gates' mother, and the rest becomes history." At least that's one version of history.

About the only proprietary technology in the PC was the BIOS. IBM did this for self-protection, according to Grad. Clones would be sure to form, just as competitive plug-compatible manufacturers did in the mainframe era. The BIOS is central to performance, and keeping it proprietary slowed down the clones' ability to bring a product to market. Eventually, the independents broke through with a BIOS that emulated the IBM PC through reverse engineering, which opened the market to even more manufacturers and further sweetened the market prospects for ISVs.

The BIOS had the IBM hallmark of something proprietary to lock people in. It was still a hardware company then, and it was going to make the money off the machines. They thought that the more they sold, the more they would make, and the more they sold, the bigger the market opportunity for the software companies.

As a lead-in to its willingness to work with ISVs, IBM had already started courting the mainframe software vendors. Recognizing that it couldn't compete in the applications programming business, IBM had convened a "love-in" for ISVs at an industry gathering sponsored jointly with ADAPSO (the Association of Data Processing Service Organizations, later known as the Information Technology Association of America). The message was that IBM welcomed and would work with third-party software developers, and help them succeed. This may have helped to set the stage for IBM to embrace ISVs to provide system and application programs for the IBM PC.

As Grad stated, "The tech-business decisions were interwoven, and were independent of the hardware decisions." Had IBM created its own unique OS, the story would be far different. "The IBM PC shaped the industry. It wouldn't have done so without that open operating system." An educated assessment of what would have happened can be made by looking at the minicomputer world: pre-Unix as a standard operating system, there were a lot of focused successes such as Data General, HP, DEC, and more. All were proprietary, and none experienced the kind of growth the PC later enjoyed. "I believe that the PC market would have grown much more slowly with a closed operating system," said Grad.

IBM's open approach replaced Apple's model (a single platform controlled by one vendor). DOS was the same type of elementary OS as CP/M, although CP/M still required a porting effort to bring applications to different versions. The IBM PC world would be unlike the CP/M world. Proprietariness was the path not taken, and, as Robert Frost said, "That has made all the difference."

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