BIG BLUE

IBM'S USE AND ABUSE OF POWER

The Truth About IBM's Success and the Ominous Implications of Its Stranglehold on the Information Society

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of the central processor and its systems and applications software. As multiprocessor networks grow in complexity, they are usually most efficient if their several controllers can route message traffic among themselves as much as possible—the alternative is having messages enter and exit central processors and interrupt their execution of application programs at every move.

Let it be stated quite simply: IBM knew full well that its most valuable customers wanted radically different controller functions than those it provided them, with more flexibility, function, and performance. Yet IBM purposely designed its communications products in such a way as to protect and further extend its monopoly rather than to effectively meet these customers' requirements. By this strategy, as shall be seen later, IBM could leverage its power outward to encompass virtually every office, factory, and industrial device that is based on a computer or microprocessor. Thus it behooves us to carefully examine IBM's methods in this critical area of networking and communications.

In the battle over controllers, one of IBM's important initial competitors was Memorex, the same company that was already giving IBM such a hard time in the disk drive market. Memorex had designed into its model 1270 communications controller much of the flexibility that customers needed but that IBM had left out. The Memorex product's functions could be changed simply by plugging in new circuit cards and removing others. IBM's box, by contrast, was hardwired and relatively inflexible. As a result, Memorex outperformed IBM when it came to adapting to new types of transmission lines and other changing aspects of the communications business, and it sought a piece of the 40 percent profit rate that IBM enjoyed on the 4,000 or so communications controllers it had installed in 1970.[29]

"The [IBM] 2700 series... requires different hardware for each type of terminal and transmission code used," stated the company's August 1971 QPLA.[30] By November of that year, IBM found, Memorex had fifty-three controllers installed and orders for another seventy-seven in hand. "The 1270 provides up to twice the price/performance of the 2700 series.... As all three IBM transmission control units are outpriced by [plug-compatible] devices, all are rated deficient."[31]

Even the two controllers that IBM had on its drawing board for future introduction "still leave us exposed to Memorex where heavy extra shift rental increases our price more than 20% above the comparable Memorex configuration." Not only did Memorex's controller cost the customer less while offering more function, but it reduced the central processor's workload and eliminated charges he had to pay IBM for excess usage. Non-IBM controllers "are priced for 24-hour use, and because they do not drive the [central processor] meter, can reduce [processor] and peripherals metering in certain applications."[32] That same QPLA stated that by September 1971, IBM customers had

315 non-IBM communications controllers installed and 185 on order. Just months after Memorex introduced its 1270, IBM analysts determined that the West Coast rival had a good chance of gaining a full third of the controller market.

In 1972, IBM responded to Memorex and other communications controller makers with its 3705, a controller that supposedly surpassed the previous IBM 2700s in function but was priced 10 percent lower than even the Memorex 1270 (itself priced up to 40 percent under the 2700s) when installed under the two-year, extended-term plan. Not surprisingly, the 3705 was expected by IBM to show a profit margin of only 5 percent after its impact on previous products was taken into consideration. That extended-lease plan, introduced at the same time as the 3705, committed customers to keeping their 3705s for at least two years. This locked users in, for although the 3705 was software-controlled, the bulk of its software would not be delivered until several years after the hardware's introduction. IBM quite knowingly unveiled the 3705 long before the key programming was ready, which meant that early users could hardly get all the function they had paid for. Their early 3705 software merely emulated the slower 2700 controllers and left out all the special functions the full-blown 3705 was claimed to offer. IBM did not much care, however, because every 3705 box installed on a two-year lease was one less opportunity for Memorex to install a 1270 and one less IBM terminal network threatened to be detached from an IBM mainframe. During the six months preceding the 3705's announcement, Memorex received 101 orders for its 1270; during the following six months, orders totaled only 56.

There were several pieces of missing software.[33] The first was called NCP (for network control program). At the 3705's premature 1972 unveiling, IBM promised NCP would be in users' hands by March 1973. But it was not until November of that year—eight months late—that the software was finally shipped. Even then, however, users were still unable to take full advantage of all the 3705's capabilities, for IBM was still not able to deliver a special software package for the 370 mainframe that was equally necessary to achieving full 3705 function. That second missing software link, known as VTAM (for virtual telecommunications access method), routed messages between the application programs in the mainframe and the 3705. Without VTAM installed, many of NCP's most valuable functions remained idle and unavailable to users.

VTAM was introduced in February 1973, just after the 3705 and NCP, as a replacement for the far simpler and field-proven program, TCAM. As its name implies, VTAM was designed for use in virtual systems such as the 370/158 and 168. It was originally slated for delivery to customers in early 1974. It did not actually reach them, however, until mid-1975. Thus, it was actually three years from the time the 3705 was first shown to users to the time its many advanced functions finally became available.

Even then, customers received less than they had been promised. As IBM worked to complete the oversold VTAM software, its engineers found they had vastly underestimated the amount of memory it would require—at one point, the software used ten times as much memory as originally planned for, or three to five times that of the simpler TCAM. Worse, VTAM's actual performance was dismally slow, for it comprised three to five times the number of program instructions as TCAM. Struggling to deliver VTAM, IBM had to cut back on its function several times. As they had when waiting for the similarly troubled OS/360 operating system, however, most customers sat tight.

The financially strapped Memorex and others were unable to evolve their products. "Because of their financial circumstances," stated an independent consultant's report on the communications business, "we expect that it is improbable that [Memorex] will develop new products but will remain in the 270X replacement field."

Why did customers not simply leave IBM and install Memorex controllers, even if only to later discard them for fully functional 3705s? Memorex had shut down its 1270 production line when orders slumped after VTAM's introduction, but it actually restarted it after IBM missed its delivery schedule and users sought alternate suppliers. The answer lies in the fact that the VTAM software was introduced to replace TCAM but, as IBM emphasized to customers, applications written to use TCAM would not work with VTAM. So if they wanted to move to the more powerful virtual operating system OS/VS, which VTAM required, customers had to choose between rewriting their installed TCAM applications to work with VTAM (a fairly costly task) or running TCAM and VTAM together (which used up considerably more scarce memory than using either package alone). While waiting for VTAM to be delivered, customers were understandably reluctant to write any applications for TCAM, knowing that those programs would later have to be rewritten for VTAM. IBM's promises, therefore, held the controller market at a relative standstill and locked Memorex out, for with VTAM on the way, Memorex's TCAM-only controller appealed to few. And until it actually had a working copy of VTAM to inspect, Memorex was forced, as it had been in the disk drive market, to deal with a phantom IBM interface.

By leveraging off the mainframe side of the processor-controller interface, which it dominated, IBM could alone dictate which products could and could not attach to the 370 processor. That interface was not the only one on the communications controller, of course. The outer interface, between controller and terminal, was just as vital, and there, too, IBM's manipulations worked well against competitors.

Whenever bits of data are transmitted back and forth along a wire, certain conventions must be held to by the sending and receiving devices, say the terminal and the computer, so that the data move smoothly and do not collide.

Among these conventions are the choice of digital code used to represent the letters of the alphabet and numerals, the rate at which the data are transmitted (measured in bits, or characters, per second), and line control disciplines. These latter are a set of strict protocols that define exactly how two network devices must interact when establishing a connection and exchanging data. The two major classes of protocols are asynchronous and synchronous.

Asynchronous protocols were developed many years ago for relatively low-speed transmission over Telex and teletypewriter networks. There, the delay time between the transmission of individual characters was dictated largely by the speed and rhythm of the typist at each end of the line. Such low-speed lines were set up to handle data moving in one direction only. In order to signal the receiving terminal as to when a character began and when it ended, extra "start/stop" signals were inserted to designate each character's beginning and end. This protocol worked well for slow transmissions, keeping each device from sending when it should be receiving, but when high-speed computer devices came into use, the extra start/stop bits became an annoyance—they wasted the line's limited capacity and increased transmission time and costs.

To remedy that situation, and to provide for sophisticated methods of correcting the errors that inevitably creep into electrical transmissions, synchronous protocols were developed under which the two communicating devices periodically exchange signals that keep each from sending while the other is receiving. This synchronization makes sure each device is sending and receiving at the same data rate, obviates the need for wasteful start/stop bits, and lowers overall costs. In 1973, IBM came out with its own version of the protocol, known as synchronous data link control (SDLC), which permitted two devices to send and receive along the same line at the same time.

The rub for Memorex came when IBM declared SDLC usable only on the low-priced 3705 controller and on the even lower-priced 3704, which was introduced later to keep Memorex from selling into sites that could not yet afford the large 3705 and therefore might opt for non-IBM controllers. IBM also declared that its new video display terminals, the 3270s, would communicate only with SDLC. These intentions made users even more reluctant to install Memorex's controller for fear they might miss out on compatibility with future 3270 terminal offerings. Until it could inspect a working version of SDLC, there was no way for Memorex to convince users of its ability to maintain compatibility.

In fact, although it was introduced in mid-1973 and was slated for first delivery in late 1974, SDLC didn't make it to users' hands until early 1976. The new protocol was made available only with the 3705's NCP software. And although IBM had claimed that its new terminals would use only SDLC, it actually shipped them before NCP was available with a special switch that permitted them to connect into the pre-NCP, pre-SDLC 3705. Evidently, although IBM's

interfaces may be inscrutable to outsiders, the company can easily break its own rules when it needs to ward off threatening competition.

Although it continued to face competition from other vendors, the 3705 became the mainstay of IBM's communications strategy, and it continues to this day to serve many of the company's largest customers. Situated as it is between the central 370 system and virtually every piece of communications and networking gear that attaches to that system, the 3705 controller is critical. In November 1973, Frederic G. Withington, the highly regarded computer industry analyst quoted earlier, evaluated the 3705 for IBM. In 1977, he testified at length at the government antitrust trial. His expert evaluations confirm that IBM's motives surrounding the 3705 were determined more by commercial aims than by a quest for optimum technical efficiency or for the satisfaction of customer demands.

"The 3705 and NCP will not be completely responsive to user needs," Withington concluded in his 1973 report to IBM. Without enhancements, he concluded, from 30 to 40 percent of IBM's customers would find the product unacceptable.

Four years later, on the witness stand, Withington stated that the 3705 and 3704 controllers, "while performing more functions independently of the central processor than predecessor devices had done, still did not and do not now offer ... complete independent message switching and network control capability." Withington recalled "no basic change" in the 3705 as compared with the IBM 2700s, since both worked "primarily under the direction of the central processing unit" and neither could switch messages without engaging the central processor. Competitors' stand-alone controllers, he pointed out, could reroute messages from site to site, a common task, "without interrupting or otherwise burdening the general purpose system."[34] Moreover, he stated, non-IBM controllers could insulate the terminal network from failures in the central computer system—the 3705 could not.

Withington noted, too, that the VTAM software was "a product unique to the IBM product line since all other... manufacturers use communications processors with stand-alone capability and only IBM requires software of this particular kind. I think, in fact, that I would not regard it as a highly risky or innovative product since it is less in functionality than the previous software offered with the 270X processors."[35] And because of the delay in delivering NCP software, he said, "the user received less functionality or capability or cost effectiveness from the total system."[36]

He recalled telling IBM in 1973 that "users would prefer to see IBM go a step further and provide the complete stand-alone communications processor capabilities," but he noted that even in 1977 those capabilities had not been added to the 3705. All that would be required, he said, would be a disk drive for tempo-

rarily storing messages, some means of entering programs into the 3705 directly (instead of only via the central processor, as the 3705 was originally designed to do), and "some output capability for reporting to the operator."[37] Certainly these were not functions beyond IBM's technical capabilities.

Yet a decade after the competition had offered these functions, IBM still had none of them in its 3705, despite its full awareness that customers wanted the functions and despite its reputation for technological leadership and visionary management. Evidently, IBM had commercial reasons for not providing its customers with what they wanted. Asked how IBM might have benefited from the choices it had made, Withington told the Court that "in some cases at least a larger central processor might be needed than if the communications processor were capable of performing the entire function, which might bring more total revenues to IBM."

Furthermore, "It is possible that in terms of future product plans, future general strategies on which IBM has spoken several times of the importance of communications systems, that IBM wishes to retain an involvement of the central processor in the . . . network control process so that should it be necessary to involve the central processor more in the future, they are able to."[38] Withington continued, "By maintaining an involvement of both the communications processor and the central process in the network control process, the two products are brought closer together in terms of software function, and it is more difficult for an outsider or third party competitor to replace" the communications controller.

Although IBM's approach to the complex problem of extending its systems into the interactive environment was fundamentally flawed from a technical point of view, it did the job IBM needed doing. That is, IBM's approach, inflexible as it was and seemingly oblivious to its customers' changing needs and the possibilities presented by changing technology, kept those customers locked in to centralized systems. Against the tide of decentralized approaches pursued by its systems competitors and the many add-on vendors that entered the industry during the 1970s, IBM contrived to keep a major part of the communications function located in the central processor and its operating system, where its hold was most secure.

To have taken any other route would have caused IBM to lose control of the computer industry in a profound way. Repeatedly, therefore, IBM put profits before its customers' needs—they asked for equipment and software products that IBM could easily have provided, but it declined for commercial reasons. Of course, the most-needed products were available from independent suppliers and were used by some of IBM's more adventurous customers, but as the interrelationships between the various components of the sprawling communications networks grew more complex, customers came to view non-IBM communica-

tions gear with increasing caution. The relatively tiny communications suppliers that had once found niches to fill in the IBM product line got overlooked, especially as IBM worked on streamlining its ponderous communications offerings. The technical sophistication of its products may be questioned, but the commercial success of IBM's strategy is hard to fault. It has won the interactive computing market hands down—and there's more commercial gain ahead.

17. REACH OUT AND CRUSH SOMEONE

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29. Op. cit., IBM, December 20, 1974, Statistical Response.
30. PX 2679.
31. PX 2685.
32. PX 2685, p. 145.
33. Much of this material comes from a memo prepared by Memorex titled "Memorex vs. IBM Communications Issue Summary."
34. Withington Tr. 58480-81.
35. Withington Tr. 58917.
36. Withington Tr. 58503.
37. Withington Tr. 58496.
38. Withington Tr. 58500.