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Track Changes:
A Literary History of
Word Processing ■

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When the MT/ST was first announced on June 30, 1964, it was accompanied by the kind of fanfare that today is reserved for Apple product launches. Coverage appeared in the *New York Times*, the *Wall Street Journal*, the *New York Herald Tribune*, and the *Lexington Leader* (the local paper for the Kentucky bluegrass town where it had been developed and manufactured). It was clear from the headlines that this was something different: the *Journal* termed it a "brainier" typewriter, while the *Leader* lauded IBM for "revealing" a new kind of typewriting. IBM's president, Gordon M. Moodie, hailed it as "a radically new concept in typewriting which will change the traditional approach to typing jobs at thousands of typing stations across the country."⁷

As its bifurcated name implies, the MT/ST was a compound device: an IBM Selectric typewriter (still cutting-edge in its own right, having debuted only three years earlier) that was connected to a magnetic tape storage unit. At the heart of the hoopla around the new product was this simple fact: the MT/ST was the first mass-market general-purpose typewriting technology to implement something we can identify as suspended inscription—"stored typing through changeable, erasable magnetic media" was how Moodie put it at the time, capturing the essentials.⁸ The basic principle was straightforward: at the same instant it was imprinted on the page, each individual keystroke was also recorded as data on a magnetic tape cartridge (each cartridge held approximately 24,000 characters), which could then be played back to have the machine go about the task of automatically printing (and reprinting and reprinting . . .) a page of text at the rate of some 170 words

per minute. Backspacing to correct an error resulted in the usual blemishes on whatever piece of paper was in the Selectric's rollers at the time, but the revised sequence of characters was what got stored on the tape: clean texts could then be produced literally at the push of a button, without the need for time-consuming and imperfect erasures. Sentence spacing, line lengths, even hyphenated words were all automatically adjusted as revisions were introduced, one of the more technically impressive features of the product. Cumbersome carbons were eliminated because multiple copies of any document were so easily had. Even more significantly, the typing mechanism could be halted while in "playback" mode to allow for the manual insertion of additional text; this made it ideal for forms and form letters of all types. With dual tape reels in the storage unit (and Deighton would opt for such a model) a skilled operator could retain two different bodies of text at the ready "on-line," and blend them with one another in the course of producing hard copy—what we would today call a mail merge. Finally, and perhaps most tantalizingly, reference codes could be invisibly inserted into the stored copy of the text to act as markers or flags for later search and retrieval. (For a project such as *Bomber*, which involved continuous cross-referencing between the different narrative episodes, this was to prove a particular asset.)⁹

Development on what was to become the MT/ST had begun as early as 1956 at IBM's main offices in Poughkeepsie, New York—some four or five years before the Expensive Typewriter program was written for the TX-0 at MIT. By 1958 the design team had moved to IBM's newly opened typewriting manufacturing plant in Lexington. Leon Cooper was the lead engineer and recalls the early ambitions for the project, which were initially limited to storing keystrokes on tape or some other correctable medium and then playing them back to print out copies on demand.¹⁰ Even in this nascent form, however, the notion of "suspended inscription"—a principle so convenient and compelling in theory—presented a host of practical problems. Because line lengths could shift as words were corrected or inserted, for example, the machine had to tell the difference between hard hyphens and soft hyphens: If a word was hyphenated merely because it broke at the end of the line, its soft hyphen could otherwise disappear; but hard hyphens had to remain no matter what. Initially, introducing two separate hyphenation keys, which the typist would have been expected to discriminate between, was what solved the problem.

More significantly, when the project first began, there was no IBM typewriter capable of functioning as both an input and an output device, which

is to say capable of both creating and receiving character codes. The earliest prototypes therefore used two separate keyboards; one was from an IBM keypunch machine (which encoded the character, which was then stored in a relay); a typewriter then received the stored code and printed it on a sheet of paper. The result was thus an "amalgamation of what IBM used to do in keypunch and what we were headed for in digital recording on tape," as Cooper recalls.¹¹ The existence of this variety of equipment for keying, punching, and encoding words, and the place of such devices in the standard office environment, testifies to the extent to which the textual landscape the MT/ST was joining was already a complex skein of human-machine modulations: Text migrated from one medium to another, shape-shifted in and out of human legibility, flowed from reel to page and page to reel, oscillated between manual and "automatic" means of inscription. Different keyboards could punch cards, perforate tape, imprint ink, and encode messages to a computer. Tape could be either paper or magnetic, and could store programmed instructions, documents, or the human voice. Even celluloid could store the printed page in the form of microfilm.

The advent of the IBM Selectric eventually solved the character encoding problem, allowing a single typewriter to be used as both an input and output device. Other problems, however, presented themselves, seemingly at every turn. A special sprocket-driven tape had to be developed in-house at IBM, for example. It had to be sealed within its plastic cartridge with a novel technique utilizing ultrasonic vibrations; and it needed a special chemical solvent to strip the magnetic oxide coding in its lead; and so on.¹² The development team, which initially consisted of Cooper and a handful of others, grew to hundreds. As the work accelerated, further possibilities suggested themselves to the designers, most notably adding a separate track on the recording medium for the so-called reference codes (which enabled search) and then adding a second tape drive. A user could create and define a block of writing and store it separately from the main body of their document: suddenly text was not just recordable and replayable, it was modularly addressable and accessible.¹³

Meanwhile, IBM's marketing division was also getting ready. When it debuted in 1961, an IBM Selectric retailed for \$500. The MT/ST would be priced a whole order of magnitude higher—at just under \$10,000, an "expensive typewriter" if ever there was one. How to sell a product at such a staggering price point, especially when the same sales force had just been in and out of the same offices pitching the Selectric, itself heralded as revolutionary for its single-element interchangeable typing ball?

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The first decision within IBM was to utilize a separate sales force, specifically the one charged with handling the Office Products Division's dictation equipment as opposed to the Selectric itself.¹⁴ This decision was to have far-reaching consequences for what was to become known as "word processing," as it directly yoked the executive's microphone to the secretary's keyboard, thus ensuring that a single sales representative now handled a complete system for the origination, revision, and duplication of text. The next challenge for marketing lay in finding the best way to exploit the nature of the technology itself. The MT/ST was oriented toward revision-heavy typing tasks—so-called volume typing, or, in the phrase the marketing department soon hit upon, "power typing." IBM quickly realized that the correctable nature of the magnetic storage medium made it particularly relevant to scenarios wherein a line of prose might be worked over multiple times, which was precisely what slowed down even the most efficient typist and forced the endless dilemmas between stopgap solutions like erasers and correcting fluid versus retyping pages in their entirety. IBM produced detailed time management studies for the sales force to draw on, demonstrating the cost-effectiveness of the MT/ST even with its stratospheric price tag.¹⁵

There was another consequence of the MT/ST's price point: one didn't purchase such an expensive piece of equipment only to have it sitting dormant for large swaths of the day as a secretary attended to the multitude of other routine tasks with which she was charged.¹⁶ As a consequence the MT/ST contributed directly to the word processing center as an organizational construct. An IBM sales representative would come through the door, and, armed with the latest data and statistics, make a pitch encouraging the business to radically change its internal system of text production. The sales rep would have examples and precedents from other businesses, right down to floor plans. He could furnish the complete suite of hardware necessary to carry a word or a sentence from an executive's lips to a typewritten page, as crisp and clean and blemish-free as a starched white shirt. While all of this seems an unlikely milieu for a novelist to step into, the fact that the MT/ST was marketed for revision-heavy office work would serve to make Len Deighton—committed, as he was, to "practical" technologies—and his assistant, Ellenor Handley, the ultimate power users.

When Deighton visited the ultramodern high-rise Shell Centre on the South Bank of the Thames to see the MT/ST in action, he was encountering it in exactly the setting it had been designed for. In much the

same way that the perceived excess of information in digital form is now a common focalizer for doubts and fears about the online world, the overabundance of paper was the central anxiety of this earlier moment. Vannevar Bush was among the first to sound the alarm: he warned that the scientific research establishment that had been so crucial to the Allied war effort was increasingly in danger of being "bogged down" under a "mountain of research."¹⁷ For Bush this was a generalized anxiety about the sheer quantity of information, and its division or compartmentalization into areas of increasing specialization. The scientist (or citizen) could not hope to keep up with it all without the advent of new tools for organizing information, the most important of which was the Memex, Bush's interactive workstation for manipulating what was then another cutting-edge document technology: microfilm. But while the Memex is widely cited as a precursor to the personal computer, it was never actually built; more than two decades later by the time of Deighton's visit to the Shell Centre, the technology of choice for business and science remained paper.

And not without reason. In their book *The Myth of the Paperless Office*, Abigail J. Sellen and Richard H. R. Harper summarize the manifold advantages of paper: it is "thin, light, porous, opaque, [and] flexible," and this in turn allows "many different human actions, such as grasping, carrying, manipulating, folding, and in combination with a marking tool, writing on."¹⁸ Even today, in an era of touch-sensitive tablet computers with E-Ink, flexible screens, and ubiquitous computing just around the corner, these characteristics can still only be emulated and approximated by our digital devices. (To wit: the popularity of Moleskine notebooks with tech-savvy millennials.) But what's arguably the single most important property of paper—integral to its identity ever since the advent of wood pulping in the latter half of the nineteenth century—was also to prove its bane. For whatever else it was, paper was also, of course, cheap. This lent it a remarkable capacity to proliferate: "Paper tends, always, to generate more paper," declared two specialists writing on behalf of the American Management Association in 1974.¹⁹

It was plain to contemporary observers that the efficiencies or else the ineptitude of an office were externalized in the procedures it developed for handling paper: its routes and trails, its revision and duplication, its signing and mailing and filing in triplicate. The twentieth century's gradual compression of the term "paper work"—first two separate words, then conjoined by a hyphen, then a single compound term—as much as anything signals

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the term's inexorable encroachment. Paper begat not only paper, but also papers—formal academic studies. Statistics abounded on every conceivable aspect of office productivity: the cost of typing a letter (about \$4, or perhaps closer to \$15 if multiple rewrites are required); the cost of filing it (about 4 cents); the number of cubic feet (1.5 to 2) of stored paper a typical employee generates per annum; the cost per cubic foot of filing space; the cost per annum to maintain it; and so on.²⁰ The overall picture that emerges is of a corporate culture obsessed with the economics of managing and controlling the "mountain" of paper (the metaphor, the same one initially employed by Bush, appears repeatedly in the literature) and converting excesses to productivity.

No single artifact better encapsulates the anxieties of the era than a 1967 five-minute short film "The Paperwork Explosion," produced by IBM and directed by Jim Henson (who had previously designed a mascot character for the Electric Typewriter Division named Rowlf).²¹ Its presentation and pacing—an avant-garde mixture of montage and electronic soundscapes composed by musician Raymond Scott—is deliberately jarring. For the first 30 seconds there is no dialog, just a rapid succession of technological and industrial images. The film then shifts to a pattern of juxtaposing brief sound bites from a variety of different speakers, each of which builds on the core theme: "At IBM, our work is related to the paperwork explosion." The montage continues, but paper and machines for handling it now dominate the imagery: copiers, feeders, shredders, sorters, mailers. "There's always been a lot of paperwork in an office." On cue, the film's title is literalized with a boom and burst of smoke, followed by pages fluttering through the blue sky.

The unifying figure in the film, appearing at intervals throughout, is a gaffer we initially see leaning on a farmyard fence and firing a corn cob pipe, a stark contrast to the frenetic pace otherwise established. "Seems to me, we could use some help," he declares as the wind furls his white hair. Enter IBM, and specifically its Office Products Division, which had been the Electric Typewriter Division up until 1964, the same year the MT/ST was introduced. "IBM can help you with the time it takes to do the paperwork." Voice dictation recorders, along with the MT/ST, are featured at this point in the film with close-ups, accompanied by testimonials and statistics. "Used systematically throughout an office, these IBM machines can increase people's productivity by 50 percent." The film then enters its final movement. The pace quickens, the cuts come faster and faster. "IBM machines

can do the work so that people have time to think." "Machines should do the work; that's what they're best at. People should do the thinking; that's what they're best at." "Machines should work; people should think." Cut back to the gaffer, who after a contemplative pull on his pipe, delivers one final line: "So I don't do much work anymore; I'm too busy thinking." Closure thus comes with a touch of comic relief, the realization that the gaffer—the only individual not dressed in business attire and situated in the only locale that is not an office interior or an industrial site—is perhaps the figure we can all aspire to be with the aid of IBM.²²

Cinematically, the sort of imagery one finds in the Henson film—close-ups of machines for sorting and stacking and typing and copying reams of paper—would become the stock visual signature of its era, much like the cascades of luminescent ones and zeroes that would follow a decade and a half later. There would have been no question for any member of the professional managerial class that they were then living in an information age. "Information," declared one authority, "is the end product of paperwork."²³ This is what Shoshana Zuboff meant by what she termed "informatting," the way in which information was capable of autonomously generating more information.²⁴ And computerization notwithstanding, information was still largely made out of paper: "No data come out of the computer without having been somewhere, somehow, part of a paperwork operation," as the same industry authority put it.²⁵

Though the words are never spoken in the film, the solution to the paperwork explosion—the means to harness all that undirected energy—was of course word processing. The proliferation of that term—again referring to an organizational concept rather than any one specific technology—can be traced through a variety of publications in the professional business management literature. Probably the term first appeared in print in the United States in 1970. Its definition at the time, given in a trade journal called *American Management*, includes the concepts of both dictation and typing, utilizes the language of centralization, efficiency, and flow, and compares word processing to what Henry Ford's assembly line did for automobiles.²⁶ The actual origin of the term, however, appears to have involved an interaction between one of IBM's German sales executives, Ulrich Steinhilper, and an American counterpart, Samuel J. Kalow.

The problem that initially brought the two together was IBM's dictation technology; German companies were proving unwilling to invest in the machines on behalf of secretaries who could take shorthand just as easily.

Kalow suggested that the dictation machines belonged instead in the hands of executives; the secretary would then type up a transcript of the tape. The dictation machine, insisted Kalow, should be the only device used by an executive besides the telephone.²⁷ Steinhilper, working from concepts he had been pondering for a number of years, then went a step further, formally yoking both dictation and typing into a complete workflow—or workflow—that he termed *textverarbeitung*, the literal translation of which is “text processing.”²⁸

Likely as early as 1955 Steinhilper had sketched a flowchart that explicitly placed “text processing” in parallel to data processing: the first cell in the chart, unifying both in a common action, was labeled “Think”; thinking then diverged into the activities of either writing or calculation, which led in turn to the material realization of thoughts in the form of either text or data, respectively. Word processing or data processing (presumably implying actual products and services) were then applied to the text and data, leading the viewer to the final cell, reuniting both concepts under the aegis of the IBM brand.²⁹ (This diagram is an exemplary artifact of what Paul Erickson et al. have termed “Cold War rationality.”)³⁰ To test his concepts, Steinhilper initiated a study at the Mercedes-Benz headquarters in Stuttgart to calculate the typical office costs involved in producing written textual communications. Text, he soon confirmed, was expensive. So expensive, in fact, that an outlay of a few thousand deutsche marks for an integrated text processing system would quickly be offset, saving time and money once an office committed to the IBM way.

The phrase “text processing” was in fact already in use within IBM’s Data Processing Division, the great internal rival to the Electric Typewriter Division—which was itself renamed Office Products in 1964, the year of the MT/ST’s launch. Kalow and others had lobbied for “Word Processing Division” instead, but they were unsuccessful. The novel construction, however, with its clear delineation in relation to Data Processing, nonetheless stuck and became widely associated with a variety of IBM products. Thomas Haigh cites a 1974 report noting that the Office Products Division was “calling virtually everything it makes a piece of word processing equipment—from a dictating machine on up to an office copier.”³¹ From there, word processing—as we have seen—took hold as a more general concept in office management, thereby recapturing some of Steinhilper’s original ambitions for the term. (And in 1971 IBM had duly acknowledged him for having coined *textverarbeitung* for them.)³²

Word processing was the fruit of business and managerial science's best attempts to come to grips with the paperwork explosion by automating and centralizing resources, maximizing the labor and productivity of executives and secretaries alike, aggressively advancing a variety of new technologies, and generally bringing to document production the same rigor and ruthless desire for efficiency that were characteristic of other areas of business operations, such as inventory control and accounting. Word processing, in short, was a means to an end. And that end was not pixels, but paper.

The early press coverage around the MT/ST yielded two very different kinds of stories: the revolutionary potential of magnetic tape storage in conjunction with typewriting, which promised to usher in an era of "perfect" final copy at a fraction of the previous effort, and a second phenomenon, hinted at in IBM president Moodie's comments about changing the traditional approach to typing tasks. The *New York Times* and the *Wall Street Journal* were both unabashedly more explicit: "Another giant step towards reducing secretaries to a purely decorative role was demonstrated yesterday by IBM" was the *Journal's* lead.³³ The *Times* was only slightly more dispassionate in tone: "The International Business Machines Corporation introduced yesterday a typewriter that it believes will eliminate a lot of the drudgery of the secretary's job. It may also eliminate a lot of secretaries."³⁴ This wanton, even cruel language provided the initial framing for the coverage in both of the major dailies. (The *Lexington Leader* stuck to the facts about the MT/ST's technical innovations.)³⁵ Of course, as we have seen, IBM itself planned to aggressively market the machine (and justify its price tag) exactly on the basis of such cost-benefit calculations.

The notion that the MT/ST and advances in office technology more generally would decimate secretarial labor also belied another reality: that it was precisely secretaries who were going to have to operate the new equipment, learning how to interact with the machine and leverage its capabilities with a very high degree of sophistication. Yet the importance of such skills was rarely acknowledged. "Women's labor, no matter how much technical dexterity, mental expertise, or training it requires, is usually defined as inferior simply because it is women's labor," argues Juliet Webster, surfacing the tautological logic that underlay the conundrum that a secretary's expertise was required to run the very machine that was supposed to be replacing her.³⁶ IBM itself realized that it would take an extraordinary ef-

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