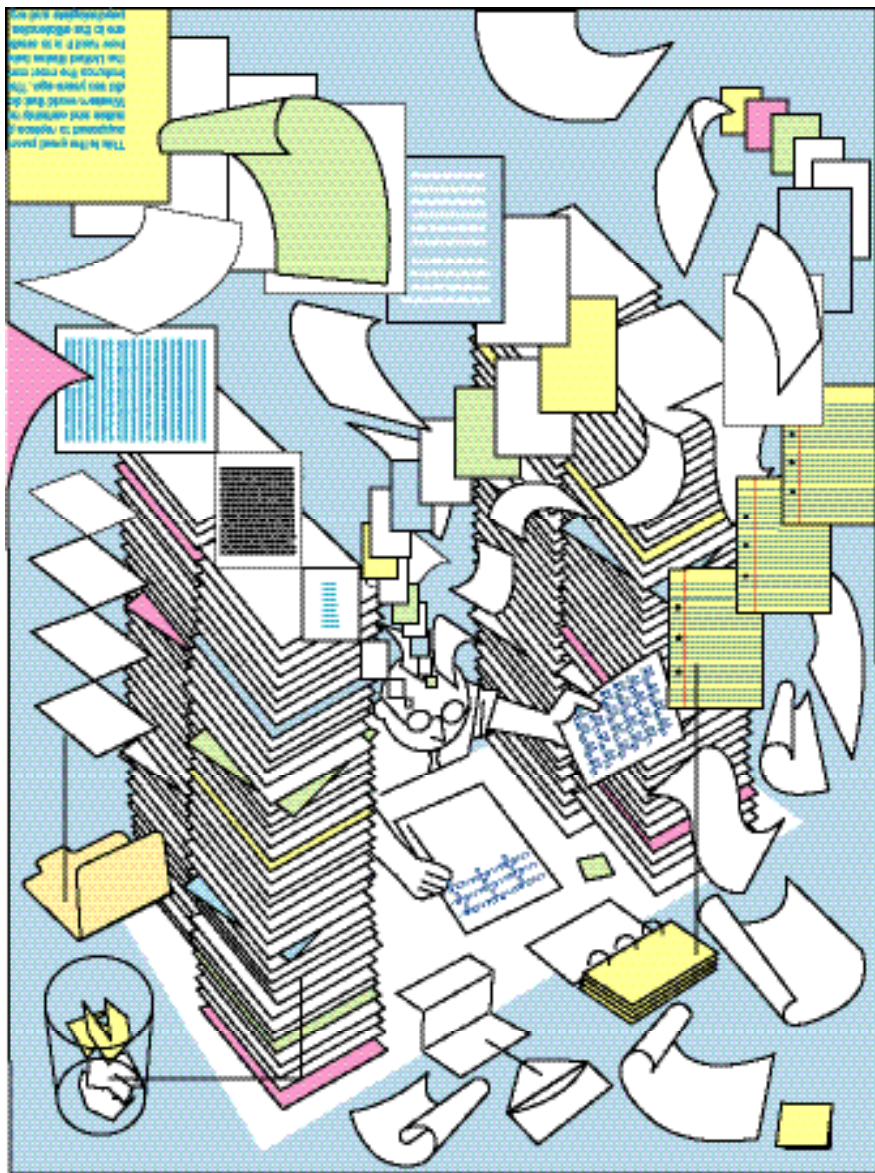


# THE SOCIAL LIFE OF PAPER

*Looking for method in the mess.*

BY MALCOLM GLADWELL



*For "knowledge workers" piles of paper represent the process of live, ongoing thinking.*

On a busy day, a typical air-traffic controller might be in charge of as many as twenty-five airplanes at a time—some ascending, some descending, each at a different altitude and travelling at a different speed. He peers at a large, monochromatic radar console, tracking the movement of tiny tagged blips moving slowly across the screen. He talks to the sector where a plane is headed, and talks

to the pilots passing through his sector, and talks to the other controllers about any new traffic on the horizon. And, as a controller juggles all those planes overhead, he scribbles notes on little pieces of paper, moving them around on his desk as he does. Air-traffic control depends on computers and radar. It also depends, heavily, on paper and ink.

When people talk about the need to

modernize the American air-traffic-control system, this is, in large part, what they are referring to. Whenever a plane takes off, the basic data about the flight—the type of plane, the radar I.D. number, the requested altitude, the destination—are printed out on a stiff piece of paper, perhaps one and a half by six and a half inches, known as a flight strip. And as the plane passes through each sector of the airspace the controller jots down, using a kind of shorthand, everything new that is happening to the plane—its speed, say, and where it's heading, clearances from ground control, holding instructions, comments on the pilot. It's a method that dates back to the days before radar, and it drives critics of the air-traffic-control system crazy. Why, in this day and age, are planes being handled like breakfast orders in a roadside diner?

This is one of the great puzzles of the modern workplace. Computer technology was supposed to replace paper. But that hasn't happened. Every country in the Western world uses more paper today, on a per-capita basis, than it did ten years ago. The consumption of uncoated freesheet paper, for instance—the most common kind of office paper—rose almost fifteen per cent in the United States between 1995 and 2000. This is generally taken as evidence of how hard it is to eradicate old, wasteful habits and of how stubbornly resistant we are to the efficiencies offered by computerization. A number of cognitive psychologists and ergonomics experts, however, don't agree. Paper has persisted, they argue, for very good reasons: when it comes to performing certain kinds of cognitive tasks, paper has many advantages over computers. The dismay people feel at the sight of a messy desk—or the spectacle of air-traffic controllers tracking flights through notes scribbled on paper strips—arises from a fundamental confusion about the role that paper plays in our lives.

The case for paper is made most eloquently in "The Myth of the Paperless Office" (M.I.T.; \$24.95), by two social scientists, Abigail Sellen and Richard Harper. They begin their book with an account of a study they conducted at the International Monetary Fund, in Washington, D.C. Economists at the I.M.F.

spend most of their time writing reports on complicated economic questions, work that would seem to be perfectly suited to sitting in front of a computer. Nonetheless, the I.M.F. is awash in paper, and Sellen and Harper wanted to find out why. Their answer is that the business of writing reports—at least at the I.M.F.—is an intensely collaborative process, involving the professional judgments and contributions of many people. The economists bring drafts of reports to conference rooms, spread out the relevant pages, and negotiate changes with one other. They go back to their offices and jot down comments in the margin, taking advantage of the freedom offered by the informality of the handwritten note. Then they deliver the annotated draft to the author in person, taking him, page by page, through the suggested changes. At the end of the process, the author spreads out all the pages with comments on his desk and starts to enter them on the computer—moving the pages around as he works, organizing and reorganizing, saving and discarding.

Without paper, this kind of collaborative, iterative work process would be much more difficult. According to Sellen and Harper, paper has a unique set of “affordances”—that is, qualities that permit specific kinds of uses. Paper is tangible: we can pick up a document, flip through it, read little bits here and there, and quickly get a sense of it. (In another study on reading habits, Sellen and Harper observed that in the workplace, people almost never read a document sequentially, from beginning to end, the way they would read a novel.) Paper is spatially flexible, meaning that we can spread it out and arrange it in the way that suits us best. And it’s tailorable: we can easily annotate it, and scribble on it as we read, without altering the original text. Digital documents, of course, have their own affordances. They can be easily searched, shared, stored, accessed remotely, and linked to other relevant material. But they lack the affordances that really matter to a group of people working together on a report. Sellen and Harper write:

Because paper is a physical embodiment of information, actions performed in relation to paper are, to a large extent, made visible to one’s colleagues. Reviewers sitting around a desk could tell whether a colleague was turn-

ing toward or away from a report; whether she was flicking through it or setting it aside. Contrast this with watching someone across a desk looking at a document on a laptop. What are they looking at? Where in the document are they? Are they really reading their e-mail? Knowing these things is important because they help a group coordinate its discussions and reach a shared understanding of what is being discussed.

Paper enables a certain kind of thinking. Picture, for instance, the top of your desk. Chances are that you have a keyboard and a computer screen off to one side, and a clear space roughly eighteen inches square in front of your chair. What covers the rest of the desktop is probably piles—piles of papers, journals, magazines, binders, postcards, videotapes, and all the other artifacts of the knowledge economy. The piles look like a mess, but they aren’t. When a group at Apple Computer studied piling behavior several years ago, they found that even the most disorderly piles usually make perfect sense to the piler, and that office workers could hold forth in great detail about the precise history and meaning of their piles. The pile closest to the cleared, eighteen-inch-square working area, for example, generally represents the most urgent business, and within that pile the most important document of all is likely to be at the top. Piles are living, breathing archives. Over time, they get broken down and resorted, sometimes chronologically and sometimes thematically and sometimes chronologically and thematically; clues about certain documents may be physically embedded in the file by, say, stacking a certain piece of paper at an angle or inserting dividers into the stack.

But why do we pile documents instead of filing them? Because piles represent the process of active, ongoing thinking. The psychologist Alison Kidd, whose research Sellen and Harper refer to extensively, argues that “knowledge workers” use the physical space of the desktop to hold “ideas which they cannot yet categorize or even decide how they might use.” The messy desk is not necessarily a sign of disorganization. It may be a sign of complexity: those who deal with many unresolved ideas simultaneously cannot sort and file the papers on their desks, because they haven’t yet sorted and filed the ideas in their head. Kidd writes that many of the people she





*"This is where I come to unwind"*

talked to use the papers on their desks as contextual cues to "recover a complex set of threads without difficulty and delay" when they come in on a Monday morning, or after their work has been interrupted by a phone call. What we see when we look at the piles on our desks is, in a sense, the contents of our brains.

Sellen and Harper arrived at similar findings when they did some consulting work with a chocolate manufacturer. The people in the firm they were most interested in were the buyers—the staff who handled the company's relationships with its vendors, from cocoa and sugar manufacturers to advertisers. The buyers kept folders (containing contracts, correspondence, meeting notes, and so forth) on every supplier they had dealings with. The company wanted to move the information in those documents online, to save space and money, and make it easier for everyone in the firm to have access to it. That sounds like an eminently rational thing to do. But when Sellen and Harper looked at the folders they discovered that they contained all kinds of idiosyncratic material—advertising paraphernalia, printouts of e-mails, presentation notes, and letters—much of which had been annotated in the margins

with thoughts and amendments and, they write, "perhaps most important, comments about problems and issues with a supplier's performance not intended for the supplier's eyes." The information in each folder was organized—if it was organized at all—according to the whims of the particular buyer. Whenever other people wanted to look at a document, they generally had to be walked through it by the buyer who "owned" it, because it simply wouldn't make sense otherwise. The much advertised advantage of digitizing documents—that they could be made available to anyone, at any time—was illusory: documents cannot speak for themselves. "All of this emphasized that most of what constituted a buyer's expertise resulted from involvement with the buyer's own suppliers through a long history of phone calls and meetings," Sellen and Harper write:

The correspondence, notes, and other documents such discussions would produce formed a significant part of the documents buyers kept. These materials therefore *supported* rather than *constituted* the expertise of the buyers. In other words, the knowledge existed not so much in the documents as in the heads of the people who owned them—in their memories of what the documents were,

in their knowledge of the history of that supplier relationship, and in the recollections that were prompted whenever they went through the files.

This idea that paper facilitates a highly specialized cognitive and social process is a far cry from the way we have historically thought about the stuff. Paper first began to proliferate in the workplace in the late nineteenth century as part of the move toward "systematic management." To cope with the complexity of the industrial economy, managers were instituting company-wide policies and demanding monthly, weekly, or even daily updates from their subordinates. Thus was born the monthly sales report, and the office manual and the internal company newsletter. The typewriter took off in the eighteen-eighties, making it possible to create documents in a fraction of the time it had previously taken, and that was followed closely by the advent of carbon paper, which meant that a typist could create ten copies of that document simultaneously. If you were, say, a railroad company, then you would now have a secretary at the company headquarters type up a schedule every week, setting out what train was travelling in what direction at what time, because in the mid-nineteenth century collisions were a terrible problem. Then the secretary would make ten carbon copies of that schedule and send them out to the stations along your railway line. Paper was important not to facilitate creative collaboration and thought but as an instrument of control.

Perhaps no one embodied this notion more than the turn-of-the-century reformer Melvil Dewey. Dewey has largely been forgotten by history, perhaps because he was such a nasty fellow—an outspoken racist and anti-Semite—but in his day he dominated America's thinking about the workplace. He invented the Dewey decimal system, which revolutionized the organization of libraries. He was an ardent advocate of shorthand and of the metric system, and was so obsessed with time-saving and simplification that he changed his first name from Melville to the more logical Melvil. (He also pushed for the adoption of "catalog" in place of "catalogue," and of "thruway" to describe major highways, a usage that survives to this day in New York State). Dewey's principal business was some-

thing called the Library Bureau, which was essentially the Office Depot of his day, selling card catalogues, cabinets, office chairs and tables, pre-printed business forms, and, most important, filing cabinets. Previously, businessmen had stored their documents in cumbersome cases, or folded and labelled the pieces of paper and stuck them in the pigeonholes of the secretary desks so common in the Victorian era. What Dewey proposed was essentially an enlarged version of a card catalogue, where paper documents hung vertically in long drawers.

The vertical file was a stunning accomplishment. In those efficiency-obsessed days, it prompted books and articles and debates and ended up winning a gold medal at the 1893 World's Fair, because it so neatly addressed the threat of disorder posed by the proliferation of paper. What good was that railroad schedule, after all, if it was lost on someone's desk? Now a railroad could buy one of Dewey's vertical filing cabinets, and put the schedule under "S," where everyone could find it. In "Scrolling Forward: Making Sense of Documents in the Digital Age" (Arcade; \$24.95), the computer scientist David M. Levy argues that Dewey was the anti-Walt Whitman, and that his vision of regularizing and standardizing life ended up being just as big a component of the American psyche as Whitman's appeal to embrace the world just as it is. That seems absolutely right. The fact is, the thought of all those memos and reports and manuals made Dewey anxious, and that anxiety has never really gone away, even in the face of evidence that paper is no longer something to be anxious about.

When Thomas Edison invented the phonograph, for example, how did he imagine it would be used? As a dictation device that a businessman could pass around the office in place of a paper memo. In 1945, the computer pioneer Vannevar Bush imagined what he called a "memex"—a mechanized library and filing cabinet, on which an office worker would store all his relevant information without the need for paper files at all. So, too, with the information-technology wizards who have descended on the workplace in recent years. Instead of a real desktop, they have offered us the computer desktop, where cookie-cutter icons run in orderly rows across a sooth-

ing background, implicitly promising to bring order to the chaos of our offices.

Sellen and Harper include in their book a photograph of an office piled high with stacks of paper. The occupant of the office—a researcher in Xerox's European research facility—was considered neither ineffective nor inefficient. Quite the contrary: he was, they tell us, legendary in being able to find any document in his office very quickly. But the managers of the laboratory were uncomfortable with his office because of what it said about their laboratory. They were, after all, an organization looking to develop digital workplace solutions. "They wanted to show that this was a workplace reaching out to the future rather than being trapped in an inefficient past," Sellen and Harper write. "Yet, if this individual's office was anything to go by, the reality was that this workplace of the future was full of paper." Whenever senior colleagues came by the office, then, the man with the messy desk was instructed to put his papers in boxes and hide them under the stairs. The irony is, of course, that it was not the researcher who was trapped in an inefficient past but the managers. They were captives of the nineteenth-century notion that paper was most useful when it was put away. They were channelling Melvil Dewey. But this is a different era. In the tasks that face modern knowledge workers, paper is most useful out in the open, where it can be shuffled and sorted and annotated and spread out. The mark of the contemporary office is not the file. It's the pile.

Air-traffic controllers are quintessential knowledge workers. They perform a rarefied version of the task faced by the economists at the I.M.F. when they sit down at the computer with the comments and drafts of five other people spread around them, or the manager when she gets to her office on Monday morning, looks at the piles of papers on her desk, and tries to make sense of all the things she has to do in the coming week. When an air-traffic controller looks at his radar, he sees a two-dimensional picture of where the planes in his sector are. But what he needs to know is where his planes will be. He has to be able to take the evidence from radar, what he hears from the pilots and other con-

trollers, and what he has written down on the flight strips in front of him, and construct a three-dimensional "picture" of all the planes in his sector. Psychologists call the ability to create that mental picture "situation awareness." "Situation awareness operates on three levels," says Mica Endsley, the president of S.A. Technologies, in Georgia, and perhaps the country's leading expert on the subject. "One is perceiving. Second is understanding what the information means—analogue to reading comprehension. That's where you or I would have problems. We'd see the blips on the screen, and it wouldn't mean anything to us. The highest level, though, is projection—the ability to predict which aircraft are coming in and when. You've got to be able to look into the future, probably by as much as five minutes."

Psychologists believe that those so-called flight strips play a major role in helping controllers achieve this situation awareness. Recently, for example, Wendy Mackay, a computer scientist now working in Paris, spent several months at an air-traffic-control facility near Orly Airport, in Paris. The French air-traffic-control system is virtually identical to the American system. One controller, the planning controller, is responsible for the radar. He has a partner, whose job is to alert the radar controller to incoming traffic, and what Mackay observed was how beautifully the strips enable efficient interaction between these two people. The planning controller, for instance, overhears what his partner is saying on the radio, and watches him annotate strips. If he has a new strip, he might keep it just out of his partner's visual field until it is relevant. "She [the planner] moves it into his peripheral view if the strip should be dealt with soon, but not immediately," Mackay writes. "If the problem is urgent, she will physically move it into his focal view, placing the strip on top of the stripboard or, rarely, inserting it."

Those strips moving in and out of the peripheral view of the controller serve as cognitive cues, which the controller uses to help keep the "picture" of his sector clear in his head. When taking over a control position, controllers touch and rearrange the strips in front of them. When they are given a new strip, they are forced mentally to register a new flight and the new traffic situation. By

writing on the strips, they can off-load information, keeping their minds free to attend to other matters. The controller's flight strips are like the piles of paper on a desk: they are the physical manifestations of what goes on inside his head. Is it any wonder that the modernization of the air-traffic-control system has taken so long? No one wants to do anything that might disrupt that critical mental process.

This is, of course, a difficult conclusion for us to accept. Like the managers of the office-technology lab, we have in our heads the notion that an air-traffic-control center ought to be a pristine and gleaming place, full of the latest electronic gadgetry. We think of all those flight strips as cluttering and confusing the work of the office, and we fret about where all that paper will go. But, as Sellen and Harper point out, we needn't worry. It is only if paper's usefulness is in the information written directly on it that it must be stored. If its usefulness lies in the promotion of ongoing creative thinking, then, once that thinking is finished, the paper becomes superfluous. The solution to our paper problem, they write, is not to use less paper but to *keepless* paper. Why bother filing at all? Everything we know about the workplace suggests that few if any knowledge workers ever refer to documents again once they have filed them away, which should come as no surprise, since paper is a lousy way to archive information. It's too hard to search and it takes up too much space. Besides, we all have the best filing system ever invented, right there on our desks—the personal computer. That is the irony of the P.C.: the workplace problem that it solves is the nineteenth-century anxiety. It's a better filing cabinet than the original vertical file, and if Dewey were alive today, he'd no doubt be working very happily in an information-technology department somewhere. The problem that paper solves, by contrast, is the problem that most concerns us today, which is how to support knowledge work. In fretting over paper, we have been tripped up by a historical accident of innovation, confused by the assumption that the most important invention is always the most recent. Had the computer come first—and paper second—no one would raise an eyebrow at the flight strips cluttering our air-traffic-control centers. ♦