

Geek's Garden

DARPA decks out soldiers with wearable sensors; researchers at Duke build a better superconductor; and how word processing evolved from movable type to Microsoft Word. **PAGE 26**

Cool Wireless Stuff


The coolest wireless devices don't just improve productivity — they're also fun to use. Here are some *Computerworld* staffers' picks. **PAGE 29**



OPINION

Malware Challenges in A Cross-Platform World

As virus writers focus on cross-platform attacks, IT must redouble its efforts to protect all kinds of systems, not just Windows, says Douglas Schweitzer. **PAGE 32**



The high cost of paper-based transactions fuels renewed efforts to eliminate it as the primary medium of exchange in business.

ILLUSTRATION BY POLLY BECKER

PAPER has been around in one form or another for 5,000 years. Paper money has been the preferred medium of exchange for business transactions for about 1,000 years. For the past 30 years, organizations have been trying — with limited success — to eliminate paper from business processes.

Given its history, it is no surprise that paper still plays a major role in most corporations. But as businesses redouble their efforts to increase productivity by automating and rethinking paper-centric business processes, IT is finally gaining

the upper hand. There's little choice, says Alan Goldstein, managing director at The Bank of New York Co. "As volumes increase, the only way firms can adjust is by going to greater automation," he says.

The effects of such efforts are being felt in the paper markets. "Paper consumption levels are essentially flat," says Marilyn Dunn, an analyst at InfoTrends/Cap Ventures in Weymouth, Mass. Sales of cut-sheet paper are expected to grow at less than 2% over the next few years, a sharp drop from the double-digit growth rates of 10 years ago. The slowdown is a direct

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BY
ROBERT L.
MITCHELL

Paper Cuts



The Paper Practice

Sonora Quest Laboratories' efforts to automate a paper-based process required it to help doctors generate paper copies of test results.

Four years ago, all of the 50,000 test requests the medical testing lab received from doctors each day arrived on paper. Today, that number has been reduced by about half. The lab, which serves patients and doctors in Arizona, created a Web-based interface that doctors can use to requisition tests and view results. The system also generates a "held order card" the doctor gives to the patient. The card includes the appointment time and a reference number that staffers in the patient service center can use to bring up the electronic order when the patient arrives for lab work.

Since most doctors work in small offices of three or fewer practitioners and many still don't have computers or Internet access, Sonora Quest offered to install PCs and printers in those offices that are dedicated to running its electronic ordering and results system. "It's a totally locked-down system. The physician

doesn't have to pay for it, but it can't be used for anything else" other than lab orders and results, says Bob Dowd, CIO at Laboratory Sciences of Arizona, which manages seven hospital labs and subsidiary Sonora Quest Laboratories.

Even with those measures, some doctors continue to use paper, so Sonora Quest images those requisitions when they're presented at one of its service centers. The staff views the image on screen and manually transposes the data into the system.

"One of the first things we did was create a workflow and billing system," says Dowd. "Everything passes from queue to queue. There is no more paper." The configuration includes two server clusters and an image archive that resides on a network-attached storage device.

One cluster functions as the workflow server, while the second runs other applications. Staffers using the system can view a requisition and image at each step as the job and bar-coded lab specimens are processed. "We're no longer sending paper around the building," Dowd says.

Disseminating results presented a different challenge. With the new system, about 95% of tests received overnight are completed, and their results are available for electronic delivery by 8 a.m. With a traditional courier service, doctors didn't receive the results until later in the day. The new system lets offices view results on a secure Web site or receive them by fax right away. In some offices, Sonora has even provided a remote printer and delivers results to it. "We monitor those, so if for any reason it doesn't go through, we call the client" to resolve the problem, Dowd says.

The new system benefits everyone, he says. Patients see fewer billing errors, doctors get results more quickly, and the lab turns around orders more quickly and avoids costly billing errors. Dowd would like to move to electronic invoicing next but faces the challenge of working with a large number of vendors. Unfortunately, he says, "most of them are still trading pieces of paper."

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result of the replacement of paper-based systems with electronic ones, Dunn says.

Businesses have made strides in reducing paper flows. Thanks to technologies such as Electronic Data Interchange and Web services, imaging and electronic documents, and document management systems, many workflows have been redesigned to reduce or eliminate paper-centric processes and replace them with more efficient ones.

Re-engineering workflows is the key to cutting costs, says Steven Thum, vice president of the business process engineering division at Bank of New York. "You really need to understand technology, how you can take advantage of it and re-engineer the underlying processes," he says.

Sticking to Paper

In some areas, however, the use of paper is likely to continue for the foreseeable future. Many people still have a cultural preference for paper-based output. For example, Sonora Quest Laboratories in Tempe, Ariz., is automating its medical test lab processes, but at the end of the day, health care providers still want a printout.

"A lot of doctors still want a hard copy. [They] like to show it to the patient," says CIO Bob Dowd.

People like to have paper copies of documents that represent the final

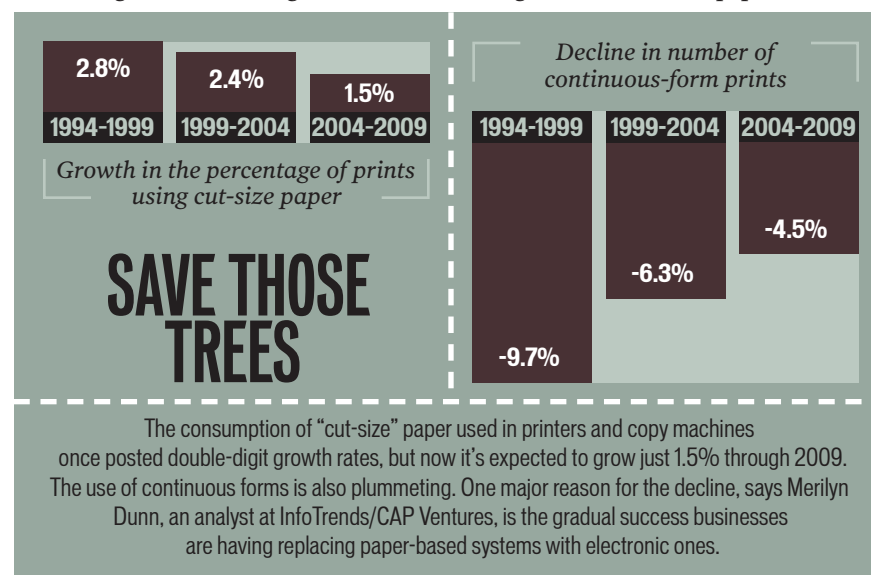
outputs of transactions, says Richard Harper, senior researcher, socio-digital systems at Microsoft Research. "Paper can act as the physical embodiment of a transaction," such as an insurance policy, he explains.

Even that could eventually change. More than 40% of the workforce was born after 1975 and has always used computers, says Dunn. "They've learned to absorb and retain information from screen displays . . . and they look at paper as redundant," she says.

That has been the case at Bank of New York, where users have adapted to viewing document images and PDF

files on screen instead of printing them. "I've seen how readily some folks who have more than a few years in this industry have embraced the ability to pull up a record on their desktop. People printing it is truly the exception," says Thum. Nonetheless, there's a difference between viewing transactional documents on screen and reading large reports and other knowledge-intensive documents in that way, says Harper.

At appliance maker Whirlpool Corp., product manuals are an area where paper remains the superior technology, despite the potential cost savings of digital documents. A paper manual



can be attached to an appliance, where it is more immediately available to the customer than electronic documents on a CD-ROM or Web site. Paper also has certain tangible qualities that are attractive for marketing purposes.

"[Marketing] may want to use a certain type of paper that conveys our brand image," says Thomas Ehrman, director of global enablement services at Benton Harbor, Mich.-based Whirlpool.

At a software company like Microsoft Corp., however, printed manuals aren't very useful. "There's no way you could print a manual for Windows, because it changes every six weeks," says Harper.

Compliance by Hard Copy

Other documents, such as contracts, must be retained on paper for legal or regulatory compliance reasons. "As much as we've gone electronic in our core business, we still have contracts, trust agreements, etc., that are required to establish a relationship with the bank," says Thum. Such documents are scanned, but electronic versions are complementary.

"I would be surprised to see actual, legally binding documents maintained in purely electronic form," says Ernie Harris, product manager at Raymond James Financial Inc. in St. Petersburg, Fla. The financial services firm uses imaging technology for inbound documents and faxes, but the desire to eliminate paper-based transactions with customers is tempered by regulatory requirements and a cultural preference for signed forms. The company processes hundreds of thousands of paper-based requests to open, update or change customers' accounts each month.

That paper adds up quickly. A new client who is retired typically opens at least six accounts and signs 20 to 30 pieces of paper, says Harris. Currently, 50% of the company's transaction requests come in by mail or fax.

Raymond James aims to address that by creating dynamic documents that consist of a common form and modules that can be integrated based on a customer's needs. "You only have to sign one contract. Now we're talking about signing one, two or maybe three pieces of paper [instead of 30]," Harris says.

Some legal documents could go away if digital signature technology became widely accepted. Harris says he is one-third of the way through an evaluation of digital signature technology that could eliminate paper contracts. That system includes a digital capture pad that embeds a secure signature image

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A DIGITAL ALTERNATIVE

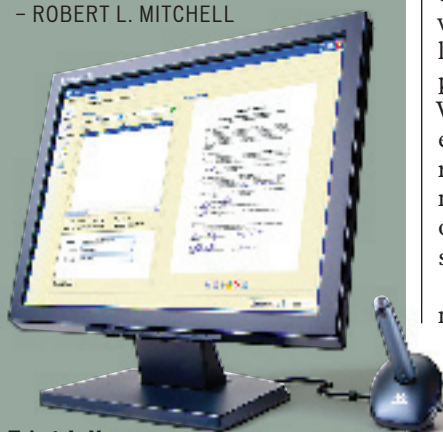
If users won't move from to paper to digital technology, why not digitize the paper itself? That approach, taken by Talario LLC's Xpaper signature-capture system, creates a digital copy of the physical document without requiring it to be scanned.

Xpaper includes a digital pen and paper that carries a unique identifier and a grid pattern that orients the pen on the page. "You print on our special paper, and when you write with our pen and dock it, you get a digital copy," says Tim Aughenbaugh, president of Brookings, S.D.-based Talario. The user creates a form in any Windows application and converts it to PDF format. When the signature is captured, it is embedded into that document.

Xpaper isn't a substitute for a signed document but supplements it, says Aughenbaugh. Xpaper creates a digital image in one step, eliminating the need to scan a document. And unlike a scan, the PDF file containing the signature is searchable. The technology is innovative, but at 15 cents per sheet, "I wonder if it isn't a solution in search of a problem," says Marilyn Dunn, an analyst at InfoTrends/CAP Ventures.

But the technology is ideal for some transactions, says Aughenbaugh: "We can retain the paper and gain the efficiencies of reporting faster or being able to bill faster."

— ROBERT L. MITCHELL



Talario's Xpaper signature-capture system

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and document hash into a Word or PDF file. However, he doubts that digital contracts will replace paper anytime soon. "We have hundreds of years of comfort applying pen to paper. It gets really uncertain when you start applying digital representations of those things," he says.

However, the payoff of a transition to digitally signed documents would be huge. "We have the potential to make

a quantum leap forward in terms of service-level turnaround. Clients could have their accounts open and ready for a transaction within minutes," says Harris.

Paper has also faded as a medium for archival storage. Bank of New York estimates it has imaged more than 290 million documents since it began scanning in 1997. Thanks to imaging and technologies such as the PDF, paper is rapidly disappearing as an archival medium, says Keith Kmetz, an analyst at IDC. "Printing is not necessarily a permanent record anymore. [It] has become a temporary repository of information," he says.

However, disposable printouts — a temporary instantiation of electronic documents that are discarded after use — are likely to continue because people like the contrast and feel of paper. Such printouts may actually be increasing in some areas, says Kmetz. To better manage that, companies are deploying document accounting systems that track who printed what when.

Battle at the Edge

On the front lines in the battle to eradicate paper — where the business touches customers and suppliers — paper has remained stubbornly entrenched for many types of transactions. But that's also the area where businesses see the greatest opportunity for savings.

For example, Web-based ordering is a great alternative, but it won't work if customers don't want to play ball. "In the early '90s, we thought everyone would go to the Internet. Five years later, we found that we had more paper than ever," says Boren Novakovic, Whirlpool's senior supply chain strategy manager for the North American region. The problem: The appliance maker receives more than 1.5 million orders a year from home builders who still send them in by fax.

Whirlpool couldn't eliminate its fax machines because those customers often work in the field and don't have Internet access. "If they want to do it by fax and we can't accommodate that, they will . . . go to another product manufacturer," says Ehrman. Now Whirlpool captures incoming faxes digitally, rather than printing them out. A new document-exchange system from Esker Inc. in Madison, Wis., receives incoming faxes and archives the images to an IBM DB2 CommonStore repository.

In the next phase, currently in pilot, Whirlpool will use optical character recognition (OCR) technology to automatically extract data from faxed forms and route them to its SAP system,

which will process the orders and fax back a confirmation.

Extracting data from images is tricky, however. Whirlpool's plan calls for a 95% pass-through rate on incoming faxes, but success will depend on a change in business processes: getting customers to use standard forms.

"We'll have a digital nightmare," says Novakovic, if Whirlpool simply converts all of its paper-based processes to digital ones without any standardization or business process improvements.

Raymond James also plans to use OCR to extract content from document images. One challenge, however, is that clients sometimes hand-write changes on the form. Rules must be created to flag such contract changes, Harris says.

Ultimately, Harris would like to create business processes that allow the processing of incoming fax orders to be fully automated. "If we could do that, it would make a huge reduction in staffing requirements," he says. But that isn't likely to happen anytime soon. Raymond James currently uses an automated fax service from EasyLink Services Corp. in Piscataway, N.J., that captures incoming fax images, routes them and attempts to extract some content using OCR. The system does

a good job routing document images, and the OCR pilot has been successful, but that process doesn't work for all forms. "There's no way to guarantee the accuracy rates Raymond James requires," says Bill Fallon, vice president of marketing at EasyLink, so each fax must also be manually reviewed.

Bank of New York has also faced challenges in extracting data from imaged requests. "We're largely dealing with an institutional client base where they each have their own formats — or no formats. We're doing OCR selectively," Thum says.

The bank has had imaging systems in place for years but has reached a point of diminishing returns. Most business transactions have moved online, but, Thum says, "paper nonetheless remains." Although incoming paper documents are scanned, many originals must be stored for compliance or legal reasons. But while the total percentage of documents remaining in paper form may be relatively small, the absolute numbers of documents coming in by mail and fax are still significant.

As the costs of manual processing increase, the potential for cost savings is providing a strong incentive to push the remaining paper-based processes out of the business. ▀

Paper's Not The Problem

Richard Harper is senior researcher of socio-digital systems at Microsoft Research in Cambridge, England, and author of *The Myth of the Paperless Office* (MIT Press, 2001). He recently spoke with Computerworld's Robert L. Mitchell about paper's evolving role in business.

■ What is the problem with paper?

I think that in 2006, concerns of paper and paperlessness seem a bit old-fashioned. We've gotten this message even from the highest levels about paperlessness. Haven't we gotten over that problem? What's wrong with paper? There's nothing wrong with paper. Paper is incredibly cheap and much more user-friendly than most computer technologies.



Richard Harper

■ What's wrong with electronic documents?

Even companies like Microsoft haven't figured out how to make the digital tangible. You would be a fool to rely on digital technology for an insurance policy, for example. Those technologies keep reinventing themselves at such a pace that they don't have a history. The problem of tangibility and persistence hasn't really been solved.

■ Where can paper be replaced?

Paper is traditionally used for jobs [for which] it's not necessarily the best use. Between organizations . . . paper becomes the default technology. What paper is good at is as a solution for someone else's problem. To do away with paper isn't the problem. It's the fact that the organizations haven't figured out how to communicate electronically.

■ Bottom line: When should you use paper, when not?

If you're changing, if you're searching, if you're gathering, you want digital. If you are understanding, if you are comparing, if you are at the end of your work, you want paper. The important thing is to just get people to be open-minded about the user of paper and digital and not to have little religious stances about it.