

# On

LIFE IN INFORMATION

Summer 2007

## **WILL IT BLEND?**

Adding video to the infrastructure mix

## **VIDEO**

Driving the Exaflood

## **INNOVATION**

New models for a new marketplace

## **INFORATI FILES**

A conversation with Wikipedia cofounder Jimmy Wales

Dr. John Halamka, CIO of CareGroup:  
"RFID is not just for tracking inventory and reuniting lost pets with their owners."

# RFID

# Keeping Track

A CIO SHARES lessons learned about RFID and its impact on the IT infrastructure

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greetings

# What's an Infrastructure? The Oxford English Dictionary defines “infrastructure” as “the subordinate parts of an undertaking” or “substructure, foundation.” In the information technology industry, we have used the term for years to describe the

technologies that collectively create, protect, and transmit information within or among organizations.

But when we study the development of the world's other, much older, infrastructures, we find that even more important than the development of technologies was the concurrent invention of concepts, models, methods, instructions, and institutions to organize, order, and simplify the use of these technologies.

Take transportation, for example. The earliest known network of roads for everyday use was developed in China. Even before the Zhou Dynasty (c. 1122–221 BCE), communications

To ensure infrastructure is reliable, we must develop “rules of the road” and continuously adjust them.

were controlled and roads maintained by a highway commissioner with his own budget. So much traffic existed during the Zhou Dynasty that the highway commissioner had to create uniform measurements for wheeled vehicles, prohibit reckless driving, and regulate traffic at busy intersections. Roads were classified into five grades according to capacity and quality.

To ensure that any infrastructure is reliable, useful, and productive, we must develop its “rules of the road” or “best practices” and continuously adjust them to incorporate new technologies and new users.

The concept of *information infrastructure* emphasizes experience-based concepts and tested methods, an occasionally neglected dimension of the IT infrastructure. It focuses on the technologies and the best practices for storing, protecting, optimizing, and leveraging information. And it calls for a new approach to putting information, not

technology, first.

Why do we need a new approach? Today's IT infrastructures are strained by an avalanche of information, most of it coming from completely new sources like RFID and in new forms like video. This new digital information, which tends to replicate itself uncontrollably, is not subject to the traditional best practices of the data center, yet it is rapidly enlarging the scope of IT managers' responsibilities.

This issue of *ON* will take you to different corners of the industry, where IT managers and users explore and conquer some exciting challenges, injecting new concepts and methods into the core of their information infrastructures. I hope you will enjoy taking the journey as much as we enjoyed putting it together for you.

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## On Infrastructure, IT and Otherwise

“When Andrew Jackson won the presidency in 1828, the principal elements in the information infrastructure were the postal system, the stagecoach industry, and the newspaper press. On the eve of the Civil War, in 1861, the infrastructure had expanded to embrace the railroad, the telegraph, the wire service, and the commodity exchange. By World War I, it had expanded once again, to include the railway mail service and the telephone grid.”

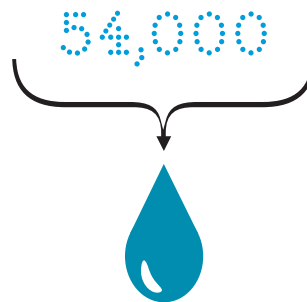


Richard R. John, “Recasting the Information Infrastructure for the Industrial Age,” in Chandler and Cortada (eds.), *A Nation Transformed by Information*, Oxford University Press, 2000.



“NOW THAT FEDEX OWNS KINKO'S, I really think they ought to consider buying Starbucks to constitute the ultimate 21st-century cybernomadic infrastructure: 24/7 coffee, wireless broadband, and handy global shipping for roving mobs of socio-knowledge workers.” —Howard Rheingold, 2004

“[AMERICA'S] 54,000 COMMUNITY drinking water systems supply drinking water to more than 250 million Americans, and municipal wastewater treatment systems each year prevent billions of tons of pollutants from reaching our rivers, lakes, streams, and coastlines.”  
<http://www.apwa.net/Advocacy/Infrastructure/>



250,000,000

“By 2009, a majority of organizations will view information infrastructure as a set of pervasive services providing access to both structured data and content.”

—GARTNER, INC., “Predicts 2007: Information Infrastructure Emerges” by Ted Friedman et al., November 27, 2006.

“The concept [of information infrastructure] incorporates people, technology, and content and the interactions between them. ... An information infrastructure is only one of several infrastructures that are essential to a well-functioning society. Others include energy, transportation, telecommunications, banking and finance, water systems, and emergency services. Because each of these infrastructures is increasingly reliant on information technologies, they are more interconnected and interdependent. Their interdependence means that more and more aspects of daily life depend on the emerging global information infrastructure.” —Christine Borgman, *From Gutenberg to the Global Information Infrastructure*, MIT Press, 2003



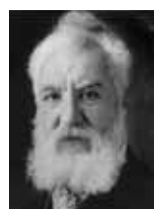
“DIGITAL TECHNOLOGIES have enabled our core infrastructure to expand geographically and in terms of functional capability... our cities and towns are now fundamentally dependent on technology to provide a range of monitoring, diagnostic, and control information that allows our society to function smoothly. ... But, when IT is incorporated into the design of infrastructure systems for high performance, it can beget new problems with infrastructures and create unintended consequences.”

—RAE ZIMMERMAN AND THOMAS A. HORAN, *Digital Infrastructures: Enabling Civil and Environmental Systems Through Information Technology*, Rutledge, 2004



“By 2008, for the first time in history, half of the world’s population will live in urban areas... Since 1975, the number of urban agglomerations with a population of 10 MILLION or more—megacities by the United Nations’ definition—grew from just THREE to 20... Among the 50 highest capacity international city-to-city Internet routes in 2006, 12 connect to megacities. ... [which] combined carried up to 924 gigabits per second of data.” <http://www.spectrum.ieee.org/jun07/inthisissue>

“At present time we have a perfect network of gas pipes and water pipes throughout our large cities. ... In a similar manner, it is conceivable that cables of telephone wires would be laid under ground, or suspended overhead, communicating by branch wires with private dwellings, counting houses, shops, manufactories, etc. .... I believe in the future wires will unite the head offices of telephone companies in different cities, and a man in one part of the country may communicate by word of mouth with another in a distant place.” —ALEXANDER GRAHAM BELL, 1878



**RESOURCES**

Information Technology Infrastructure Library (ITIL®) <http://www.itil.co.uk/> and <http://www.itil-itsm-world.com/>

Information Technology and the World <http://gerryhoffman.blogspot.com>

Infrastructure Asset Management Conference, November 6–7, 2007 <http://www.marketforce.eu.com/iam/>

IT Infrastructure Management Conference, November 6–9, 2007 <http://www.itimassociation.com/itim/2007/>





# Ready for Prime Time

*By Scott Kirsner* Last November, marketing director George Wright uploaded five videos to a new website his company had created. The videos were simple: They showed Wright's boss, K-Tec founder Tom Dickson, wearing a white lab coat and safety goggles, and operating one of the company's products.

Since then, the small Utah company's videos have been



**K-Tec's humorous Internet videos, featuring founder Tom Dickson (opposite, in the lab coat, with marketing director George Wright) have been a hit.**

**John Engberg (left), of Kohler Company, finds that using a video hosting service is preferable to Kohler streaming or hosting content itself.**

**INTERNET VIDEO** can create a competitive advantage, reaching audiences less expensively, and engaging with them longer, than traditional broadcast media.

watched more than two million times, and Dickson has made an appearance on NBC's "Today Show."

The secret to K-Tec's killer video strategy? An amusing series of video product demonstrations called "Will It Blend?", which feature Dickson dropping things like an iPod, a golf club, and a bag of marbles into K-Tec's high-powered \$400 blender.

In 2006, video viewership on the Web exploded. Suddenly, the average U.S. consumer was watching about

100 minutes of video per month, according to comScore Media Metrix. TV networks began putting more of their shows online, supported by advertising or sold a la carte through Apple's iTunes Store. From January to June, YouTube was the fastest-growing site on the Internet, according to Nielsen/NetRatings. Before the year was out, the site had been purchased by Google for \$1.65 billion, and was reaching a monthly audience of 29 million visitors, according to comScore.

But while media conglomerates have long been considering the impact new online viewing behaviors will have on their businesses, most enterprises are still trying to make sense of the video explosion, and determine what role video will play in their external and internal communications.


"Before long, every website will use video, whether it's produced internally, or by someone else," says James McQuivey, vice president at Boston-based Forrester Research.

Internet video presented right can create a competitive advantage, reaching audiences less expensively, and engaging with them longer, than traditional broadcast media. But deploying video effectively will require adaptability and constructive communication between IT execs and their colleagues in other lines of business, such as marketing, sales, and human resources. Together, they'll have to address a dizzying set of questions: What sort of videos will be produced, on what kind of budget? What format will they be stored in? Will they sit on a company-managed server, or one run by a third-party? Should videos be available forever at the same URL, or will they need to be expired at some point?

"Video is the next great content type to manage," says Steve Pattison, vice president of marketing and business development at Media Publisher, Inc., a company that sells software for managing video assets.

#### MOVING BEYOND MARKETING

Most of the earliest corporate users of video have been focused on marketing, like K-Tec's "Will



Andrew Salesky, of Charles Schwab, says that videos of satisfied Schwab customers work much like word-of-mouth referrals.

It Blend?" series, or Frito-Lay's advertising contest, in which the best consumer-created ad for Doritos was aired during the Super Bowl this past January, and five finalists were awarded \$10,000 each. (One analyst estimated that Frito-Lay's consumer-created ads were seen by more people on the Web than during the Super Bowl telecast itself.)

But increasingly, companies are using video to communicate with current and prospective employees; business partners, distributors, and sales agents; and shareholders and Wall Street analysts. At Microsoft, a site called Channel 9 offers videos of interest to the company's community of developers. K-Tec has created several videos that cover the installation and operation of its commercial blenders, which are used in restaurants, cafes, and bars, and Kohler Co., the Wisconsin plumbing supplies company, offers video installation guidance for professionals and do-it-yourselfers. Companies like Sealy Corp., the mattress manufacturer, and Johnson & Johnson, have augmented their annual reports with videos; one of J&J's clips focused on the development of a next-generation sunscreen product. At Charles Schwab, employees can watch executive presentations on topics like corporate social responsibility.

But Andrew Salesky, senior vice president of client Web services at the San Francisco-based financial services firm, says that the company's video strategy is still predominantly focused on videos that will attract new customers. "Referrals from satisfied clients are the number one reason we grow," Salesky says, "and what we've tried to do with videos is put up videos of clients talking about their experiences at Schwab. It's like a virtual referral." The company also posts all of its television ads online.

Video content at both Schwab and Kohler is produced by an in-house ad agency. K-Tec employs a single video producer, who also makes trade show videos and instructional videos for workers who use the company's

## Internet Video: Think Before You Shoot

Internet videos can be "a very straightforward way for a company to demonstrate the value of the products and services it offers," according to Forrester Research analyst James McQuivey. Before diving in, though, here are five questions to consider:

- 1. HOW MUCH WILL YOU SPEND?** Internet videos can be produced cheaply – and low production values can be part of the charm of a series like K-Tec's "Will It Blend?" ([www.willitblend.com](http://www.willitblend.com)) Investing Hollywood-size budgets in video production can lead to executive disapproval if a big audience doesn't materialize.
- 2. HOW WILL YOU HOOK VIEWERS?** Whether the intended audience is employees, customers, or partners, Web videos need to be short, and they need to grab the viewer within the first 30 seconds. Just like changing a channel on TV, it's easy to close a video window or click the "stop" button.
- 3. WHAT FORMAT WILL YOU CHOOSE?** Popular formats for delivering video online include Adobe's Flash, Microsoft's Windows Media, and Apple's QuickTime. Most companies are opting to standardize on one format. Flash seems to have an edge, since it plays on most platforms, and is the standard chosen by YouTube, the dominant video site on the Internet.
- 4. WILL YOU HOST IT ON YOUR SERVERS, OR ENLIST A THIRD-PARTY?** Third-party hosting services such as Brightcove or Revver can help ensure that videos are always available – even when their popularity spikes.
- 5. HOW WILL YOU MEASURE THE IMPACT?** It's important to set realistic goals about what video will achieve, and also put in place tracking systems to tally not just how many times a clip has been seen, but what action it inspired (like requesting more information, looking up a distributor's location, or making a purchase.)

commercial blenders. The production ethos at K-Tec could be described as "keep it cheap." The video studio is "a corner of a room, with a backdrop and walls and our little blending platform," Wright explains. "When we make a video, there are about four of us there, including myself and Tom Dickson," the company's on-camera spokesperson.

### TAKING A COORDINATED APPROACH

Marketing, sales, and human resources executives tend to be the catalysts for video initiatives in most companies. For that reason, the potential exists for them to add videos to the corporate website, or post them to third-party video hosts like Brightcove or YouTube, without IT's involvement. That lack of coordination can create problems—like a sudden surge in bandwidth usage, videos circulating in many different formats, or lack of control over where the company's videos appear.

"When we would walk into a customer like eBay, a

**"VIDEO IS THE NEXT great content type to manage," says Steve Pattison, vice president of marketing and business development for Media Publisher, Inc.**

lot of the video usage was in departments like corporate communications, or for applications like distance learning,” says Steve Pattison. “You’d see the corporate communications users screaming, ‘We need to do this,’ and IT was thinking, ‘OK, how does this work?’”

Together, IT and the business units can start to determine whether video should be stored in-house or by a third-party vendor, and project how much bandwidth will be required for enterprise video.

Often, companies decide to work with a content delivery network to make sure that videos load quickly and don’t freeze mid-play. “If you’re a large enterprise with offices around the globe, providing a good video experience is complicated, and performance is an issue,” says Suzanne Johnson, senior product marketing manager for Akamai’s digital media solutions. Among the company’s customers are Anheuser-Busch, which offers video content to thousands of employees and hundreds of distributors. After watching its own bandwidth bills skyrocket, K-Tec now chooses to use the free hosting services Revver and YouTube for its videos; Kohler pays a fee to Brightcove, based on how many times its videos are seen.

of marketing at Veotag, a company that offers a tagging system. “It’s like looking at a book’s table of contents, rather than flipping through the whole thing at random.” One tagging pioneer is the nonprofit group Jazz at Lincoln Center, which presents several of its master classes with jazz musicians online, complete with a clickable breakdown of the topics they address on the right side of the screen.

Companies creating a video strategy must also address the question of control: How widely do they want to make their videos available? K-Tec is happy to have its “Will It Blend” videos spread far and wide. “If you want to create a viral advertising campaign, you’re not going to be able to control it,” says Wright. “That’s an inherent risk.” The videos can be easily e-mailed to friends and embedded in other websites, and the company offers an RSS feed that users can subscribe to, so they see a link to each new video when it appears. (The company produces about four or five new videos every month, often based on viewer suggestions.)

But Schwab prefers its videos to play only on its website. “Being a regulated firm, we have to be very sensitive to the communications we make available,” Salesky says. At

## OFTEN, COMPANIES WORK with a content delivery network to make sure that videos load quickly and don’t freeze mid-play.

“By our measure, it’s a reasonable cost, and it’s better than hosting or streaming the stuff ourselves,” says John Engberg, Kohler’s manager for media planning and online marketing. “You don’t want video to be something that crashes our servers, and we like being on somebody else’s backbone.”

Many companies also commit to a standard format for producing and distributing video. “The most popular formats we’re seeing, from a trend perspective, are Adobe’s Flash and Microsoft’s Windows Media,” says Johnson. “Flash has great cross-browser capabilities, and people like Windows Media because of the digital rights management capabilities.”

Other tech issues to consider, says Pattison at Media Publisher, include content management, permissions, and usage reporting. “You want to see who has viewed what, and for how long,” he says. In many cases, data about video usage needs to be integrated with website analytics software, allowing a company to track what a user did after viewing a video—like opening a new account, or filling out a form requesting more information.

Only a few companies have begun experimenting with tagging their videos, or dividing them up into chapters so that users can jump directly to the part of a video they want to see. “As videos get longer, and you have training classes and CEO speeches and product demonstrations, the user needs help figuring out what’s inside a video, almost before they start it,” says Howard Seibel, vice president

Kohler, any video that the company uploads to Brightcove can be taken down if necessary.

Even in mid-2007, some companies still regard video as an experiment. “We’re continuing to test whether this is an effective medium for explaining the value of a Schwab relationship,” says Salesky. “Does it impact a prospect’s likelihood to convert?”

But at K-Tec, George Wright has already been converted. “Our Web sales have increased by a factor of five,” he says, “and our products have a bigger presence at retailers like Sam’s Club and Costco because of ‘Will It Blend.’” In March, Tom Dickson was booked on “The Tonight Show,” where he blended a rake handle.

Video, says Johnson at Akamai, “can be a lot more entertaining than sitting and reading a brochure.”

But creating video that people will want to watch, and delivering it in a way that makes sense for the organization, will require two things: hands-on experience working in the medium, and an ongoing conversation between IT and the relevant business units.

◆◆◆ **Scott Kirsner is a Boston-based technology journalist and author of the recent book, *The Future of Web Video: New Opportunities for Producers, Entrepreneurs, Media Companies and Advertisers*. He can be reached at [kirsner@pobox.com](mailto:kirsner@pobox.com).**



# How much of your stored data can you afford to lose? (How about none?)

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# DIGITIZING OUR INFORMATION HERITAGE



Ann Speyer

## Making more of “America’s museum” collections available on the Internet

On May 21, EMC announced a \$1 million donation to the Smithsonian Institution digitization program. On the same day, at the first keynote session of EMC World, Smithsonian Institution’s Chief Information Officer, **Ann Speyer**, was interviewed by Dan Morrow, Principal, Jamestown Exploration Company. Here are excerpts from the interview.

**Dan Morrow: I’d like to begin by asking what you do at the Smithsonian, and what are the best parts of your job?**

**Ann Speyer:** I’ll have to say I’m an information broker, if you will. I create internal and external partnerships and try to find commonalities across incredibly diverse disciplines, as you can imagine.

When I first started with the Smithsonian, I would say the thing that most impressed me was how everybody—anybody that you approached or worked with—loved their job. I had never worked in a place where people were so passionate about their work, everyone from the historian to the scientist to the gardener, even the IT analyst, if you can believe that. It’s just something about working for a place where your mission is to increase and diffuse knowledge that gets you energized and invigorated.

**Let’s talk about the flip side of that, the kinds of things that keep a chief information officer leading a large Washington institution of the 21st century, the kinds of things that keep you up at night. What’s the biggest challenge**

**you have to face in your position at the Smithsonian?**

Well fortunately, the CIO that preceded me did an incredible job at establishing our IT infrastructure and replacing a lot of our back-office applications. So now I get to do the fun part, which is working with the mission systems and finding technology solutions for the scientists, the curators, the historians. But capturing our cultural heritage through digitization is probably one of the biggest challenges that we face today.

We have nearly 137 million diverse objects, everything from Lincoln’s top hat to Dorothy’s ruby slippers. But there’s only up to about 3% of our collection that’s ever available to the public for view at any given time. Of those 137 million objects and specimens, only about 13.3 million are available in electronic form to scholars and the public, and for these, there are only about 821,000 digital images. James Smithson left his fortune to the people of the United States to form an institution for the “increase and diffusion of knowledge.” A lot of activities at the Smithsonian either increase knowledge or diffuse knowledge. Digitization is one of the unique activities at the Institution that does both.

**One of the hardest questions I ask is about how you’d like to be remembered by the next generation of stewards of this trust. How would you like them to think of Ann Speyer in a hundred years?**

Actually, that’s really not a hard question at all because growing up in a small town I never had the opportunity to go to Wash-

ington, D.C. and see the Smithsonian until I moved there. Probably not unlike many of you, I thought the Smithsonian was one institution and it wasn’t really until I saw it for the first time that I realized how vast it was and I certainly wasn’t aware of all of the research activities and the contributions to the world that the Smithsonian makes. There are 19 museums and galleries, a national zoo, and nine research centers all over the world. And today I know there are many children growing up in small towns all over America that may never get to see the Smithsonian in person. With the Internet and digitization, I feel that I can help bring the nation’s collections and research to children and families all over America—and the world, for that matter. So that’s really why I’m here.

I would like to be remembered as one of the people that were able to effectively use technology to make that vision a reality. For instance, I recently brought some wireless hotspots to several of the museums and gardens in DC. I have a 5-year-old son and it provides me great pride to think that one day 10 years from now when he’s walking around the Mall with his friends using whatever wireless technology is available at that time, that he’ll be able to say, “You know, my mom first brought wireless to the Mall.” It’s really unique to be in a position—because it doesn’t happen very often—where your job affords you the opportunity to make a difference for your children, for your community, for your country, and for the world.



## Preserving memories for America and the world

On June 4th, **Laura Campbell**, associate librarian for strategic initiatives and chief information officer of the Library of Congress, received the EMC Information Leadership Award at IDG's Computerworld Honors Program's 19th Annual Laureates Medal Ceremony in Washington, D.C. This annual award recognizes the extraordinary achievements of selected individuals whose positive contributions to the IT revolution have left an indelible mark on the world. **ON** asked **Laura Campbell** to comment on her experience in leading the Library's large-scale initiatives to preserve digital materials at risk of loss and to make its online collections available to people worldwide.

### **ON:** Why is digitization important to the Library of Congress and for its audiences?

The Library of Congress has 134 million items from all over the world. We collect in 450 languages, and in all subject areas, representing not only the story of America, but the record of humankind. We have 14 million photographs, 56 million manuscripts, six million maps, the world's largest recorded sound and movie collection, and other items that can't be found anywhere else. In order to see these materials, a researcher would have to come to Washington and make an appointment at one of our 22 reading rooms. With the World Wide Web and digitization we can now provide information online to anyone, anywhere.

### **Tell us about the challenges you've encountered.**

Digitization is expensive. People think about digitization as though it's much like photocopying. That's not quite the case, particularly when you're dealing with unique materials. You need to first prepare the material for digitizing. You may need to describe the material if it doesn't have a bibliographic record or some sort of description accompanying it. So the cost of labor that goes into organizing and assembling the materials to get them ready to digitize makes it an expensive process. In some cases, the material may be fragile and need to be conserved so you won't damage it during scanning. And then there is the big cost associated with developing a trusted repository for the content we digitize as well as the materials that are born digital. Today, we digitize anywhere from 750,000 to a million items a year.

### **How do you protect digital files from being accidentally or maliciously destroyed?**

When we digitize something, we'll have a display copy, a reference copy, a preservation copy, and then a copy of the preservation copy. And with our partners, we have implemented redundant storage as well as distributed caching of files. The issues surrounding the collection and preservation of not only the analog materials we digitize, but also the extraordinary amount of born-digital content that is at risk of loss if we do not save it now, are what led to the development of our National Digital In-

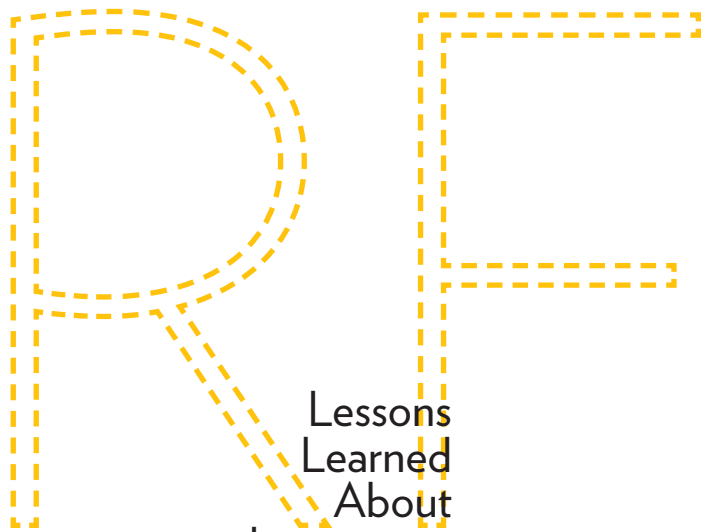
formation Infrastructure and Preservation Program.

### **Did your projects involve any formal or informal collaboration with other institutions?**

Yes. To develop American Memory, our flagship website, we worked with 33 other institutions to digitize materials. And then we moved from there to working with six other countries in digitizing international materials that describe the experience of bilateral relationships between the United States and those six nations. For the digital preservation program, we have assembled a national network of nearly 70 partners, all working together to leverage their experience and expertise. I'm happy to say that if you bring divergent strengths together they will rise to the occasion of solving problems. We're learning a whole lot about how to work together.

With the World Wide Web and digitization we can now provide information online to anyone, anywhere.

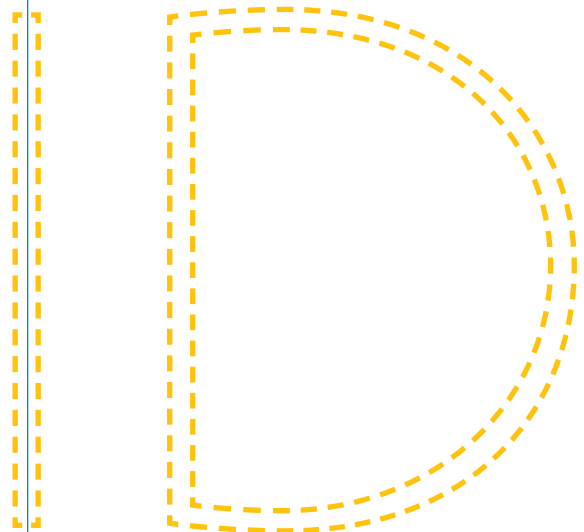
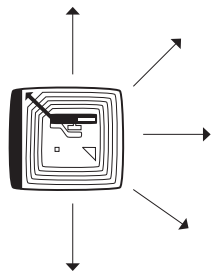
By Dr. John Halamka



Lessons  
Learned  
About  
Innovation,  
Infrastructure,  
and ROI

Sharing lessons learned from an RFID deployment at Boston's Beth Israel Deaconess Medical Center, Dr. John Halamka, CIO of CareGroup and Harvard Medical School, discusses how RFID can help organizations achieve key goals and what the impact may be on the IT infrastructure.

**SEND DATA NOW**  
When a passive RFID tag is passed near a reader, it transmits its onboard data to the reader.



WHEN THE WORLD'S most famous wizard, Harry Potter, wants to discreetly explore the Hogwarts School, he consults the Marauder's Map, a magical device that shows every classroom, office, and secret passageway at the school. The map also shows the identity and location of everyone wandering its grounds. So Harry knows when the dreaded Professor Snape is busy in his office. And he can tell when the caretaker, Peeves, is just around the corner, requiring Harry to take evasive action.

While the Marauder's Map may seem like a schoolboy fantasy, it's not so far-fetched. From a technology standpoint, a crude version is feasible today, thanks to the evolution of radio frequency identification (RFID) technology, which makes it possible to track people and objects with increasing accuracy. In fact, many organizations are exploring

A man with dark hair and glasses, wearing a dark suit jacket over a dark shirt and dark trousers with a black belt, stands in front of a building with a large arched window. The scene is outdoors with green bushes and trees. The man is looking slightly upwards and to the right.

**ARE YOU A DOCTOR  
OR A PLASMA TV?**

An innovator on many fronts, Dr. John Halamka has an RFID chip implanted in his arm, containing his medical records number. The main inconvenience: He sometimes sets off security alarms at Best Buy or Home Depot and must explain his situation to security staff.

# RFID rules of engagement

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**RULE 1: CHOOSE A MEANINGFUL CHALLENGE**

In testing passive RFID, Beth Israel Deaconess Medical Center focused on accurate patient identification, a critical safety issue in health care.

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**RULE 2: DEMONSTRATE RAPID ROI**

For active RFID tags, the hospital showed a first-year savings of \$300,000 on an investment of \$100,000.

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**RULE 3: LEVERAGE YOUR CURRENT INFRASTRUCTURE**

Using the existing Wi-Fi network eliminated the need to invest \$2 million in proprietary network infrastructure.

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**RULE 4: RECOGNIZE WHEN BAR CODES ARE "GOOD ENOUGH"**

Less costly than RFID, bar codes were an acceptable choice for two applications that were considered: employee badges and identification bracelets for adult patients.

innovative and strategic uses of RFID, beyond the well-known applications of tracking inventory and reuniting lost pets with their owners.

## FROM THE GAS PUMP TO THE SUMMER OLYMPICS TO THE ER

Contact-less payment systems, such as the Exxon Mobil Speedpass, enhance consumer convenience and speed revenue collection by letting consumers make credit card purchases with the wave of a card or token. Dow Chemical is involved in an initiative that combines RFID and GPS to enable real-time tracking of railway cars carrying hazardous materials. In preparation for the 2008 Summer Olympics, Beijing is rolling out an RFID ticketing and fare collection system for its transport network of subways, buses and taxis, which handle 10 million journeys a day.

In the health field, a Florida-based center for Alzheimer's care has enlisted 200 volunteers who will be implanted with a passive RFID chip (such as the one I have in my arm) that will help identify a person and provide medical history data if an individual arrives at an emergency room in a confused or unresponsive state. In the near future, we expect to see RFID sensors that can check a diabetic's glucose level, eliminating painful and frequent finger pricks.

At Beth Israel Deaconess Medical Center, which is part of CareGroup, we decided in 2006 that the technology was sufficiently mature to explore whether RFID could enhance our mission-critical processes in a cost-effective way. Knowing that the two basic forms of RFID—passive and active—offer different value propositions, we decided to test both. (See sidebar, "Passive vs. Active vs. Barcodes.")

## A MISSION-CRITICAL TASK: PATIENT IDENTIFICATION

To explore passive RFID, we focused on the challenge of positively identifying patients. Accurate electronic identification helps ensure a patient is given the right medications, samples sent to the lab are correctly labeled, and the patient is not accidentally subjected to the wrong procedure. It also lays the groundwork for electronic administration of medications.

Before committing to a solution, however, we weighed the benefits of RFID against those of bar codes. We determined that barcoded wristbands were adequate for identifying adult patients, but passive RFID was a better choice for neonatal infants. For example, when a bar-coded wristband is curled around a baby's tiny wrist, it's difficult to read and may need to

be flattened out or repositioned. In contrast, a passive RFID wristband can be scanned without touching the infant. This means less disruption for a fragile newborn and less likelihood that slender feeding tubes and monitoring wires will be disturbed. Passive tags are also used to label and track mother's milk, which is stored in containers. A software application and RFID scanner ensure each infant receives the right milk and creates a record for feedings.

## MAKING BETTER USE OF EQUIPMENT AND STAFF TIME

For testing active RFID, we chose a different application: keeping track of medical equipment such as electrocardiogram machines, bedside monitors, and IV infusion pumps. These costly devices are mobile, so it's easy to lose track of them in a large facility. In addition, some staff members hoard scarce equipment to be sure it's available when they need it. As result, \$500,000 worth of hardware goes missing in a typical year, forcing the hospital to carry extra inventory rather than risk patient safety. In addition, doctors and nurses were spending an average of 20 minutes a day looking for misplaced equipment, at a cost of up to \$100 an hour.

The active RFID application we are now implementing addresses all these issues. An active RFID tag is attached to a medical device. Every few seconds, the tag emits a signal that identifies the device to any readers within a 10-meter radius. By measuring relative signal strength, multiple readers can determine where the device is located. In turn, this data is passed to an application, which is available from desktops throughout the hospital and allows staff members to see where the nearest piece of equipment is located so it can be quickly retrieved. Preliminary results suggest this new application will reduce the average equipment search to five minutes.

## ASSESSING THE IMPACT ON INFRASTRUCTURE

With an estimated 500 of the planned



The RFID chip implanted in Dr. Halamka's arm allows authorized physicians to retrieve his medical records from a secure Web server

5,000 devices now tagged, Beth Israel Deaconess continues to roll out the equipment tracking solution. However, a number of clear lessons have already emerged from our passive and active RFID deployments regarding the impact of RFID on IT infrastructure and related costs.

**LEVERAGING WI-FI:** In implementing active RFID, we lowered our solution cost by leveraging the Wi-Fi network already in place at the hospital, rather than using a proprietary frequency. A proprietary system can provide more accurate location, to the level of about a square meter. However, it would have required us to spend an additional \$2 million in network infrastructure. The tradeoff we accepted is that we can only tag items that are large enough for staff members to easily spot within the current 10-meter accuracy. As the economics and accuracy of active RFID improve, we will be able to track items that are smaller and less expensive.

**CUTTING EDGE VS. SAFE HARBOR:** In

deploying PanGo Networks active RFID tags and Cisco lightweight wireless access points, we chose Cisco network components that incorporated cutting-edge features over Cisco "safe harbor" code that maximizes reliability and stability. Our subsequent experience suggested that cutting edge was not stable enough for a clinical setting. Now, in 2007, geolocation features are part of the "safe harbor" release, providing both advanced features and stability.

## Passive vs. Active vs. Barcodes

The economics of RFID are becoming more attractive as the size and cost of tags drop, battery life increases, and the technology becomes standardized. Today:

- ➔ Passive RFID tags are small and inexpensive (about 50 cents), making them suitable for many applications. However, to be read, the tag must be placed in close proximity to a reader, meaning some human action is usually required.
- ➔ Active tags are about the size of a pager, include a battery (enabling the tag to emit a radio frequency signal), and cost \$10 each. They are suitable for tracking larger objects or people in a sprawling facility. Battery life is a potential maintenance issue.
- ➔ Barcode applications share much in common with passive RFID but are lower in cost due to their wide deployment and a per-tag cost of about one cent.

**TAGS AND ACCESS POINTS:** In purchasing active RFID tags, we found it's important to purchase tags that do not associate with a specific access point. Access points downgrade their speed to support the most distant or weak associated device, which can degrade performance as the tags move around.

**RADIO FREQUENCY INTERFERENCE:** All new devices being introduced into the hospital require clearance from Clinical Engineering to ensure their frequency does not conflict with existing devices. We followed this standard procedure for our RFID projects.

**BATTERY LIFE:** At the time we deployed our solution, the batteries in active tags had to be replaced every six months. Newer tags have a battery life of two years, making maintenance easier.

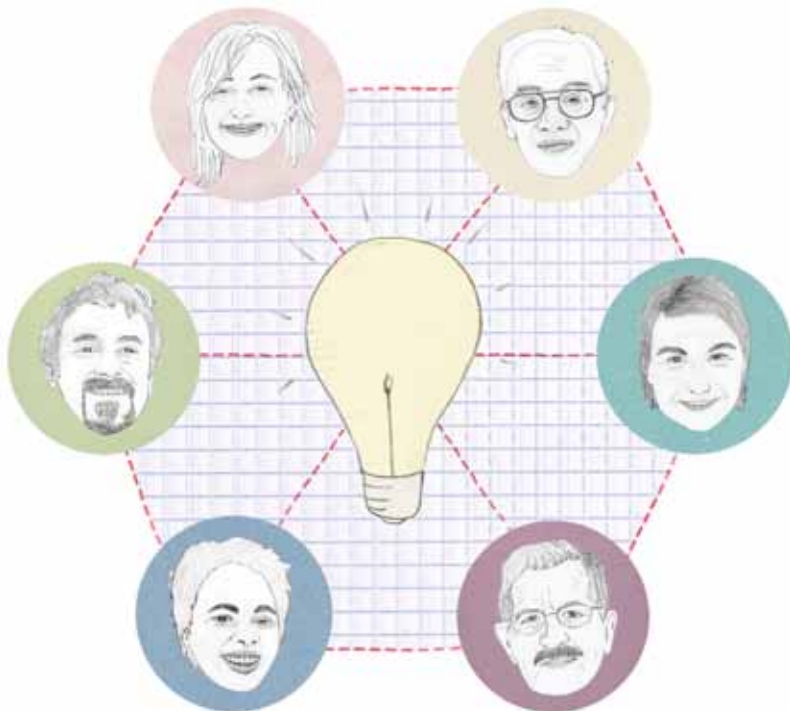
**SECURITY:** Passive tags are encoded with a patient's medical record number but no patient data. Due to other safeguards, it is unlikely this information could be used to compromise a patient. No data is stored on active tags, so security is not an issue.

**PRIVACY:** Employees were adamant about not wanting active RFID used on employee badges, which would have created the potential to track people's movements without their knowledge. We adopted bar-coded badges instead, which require the employee to swipe or wave their badge near a reader for their location to be identified.

# UNBOUNDED

HOW  
COLLABORATIVE  
APPROACHES ARE  
CHANGING THE  
PRACTICE OF  
INNOVATION

BY  
NEAL  
KANE



# Innovation

At one point or another, almost everyone has dreamed of stumbling upon The Next Big Thing. The next America Online. The next iPod. The next Starbucks. In this era of Everything 2.0, the prospect remains as tantalizing as ever.

Yet in fact, the notion of a single individual transforming his or her “eureka” moment into a tangible innovation has become increasingly quaint, if not downright antiquated. In our hyper-connected age of ubiquitous access, supported by an ever-broader and more powerful IT infrastructure, innovation has become an increasingly collaborative affair. A more horizontal model of innovation has emerged – one that enables dreamers and doers to find and collaborate with kindred spirits around the globe using nothing more than a browser and a high-speed connection. This technology-enabled collaboration not only accelerates commercialization, but also makes it easier to create products and services that align better with specific market needs.

## FROM SILOS TO RELATIONSHIPS

In the 20th century, the research paradigm focused on the laboratory, where individuals or teams worked in seclusion behind closed doors, exploring concepts that might (or might not) be subsequently developed and commercialized. The explosion in Web-based activity over the past dozen years has transformed the R&D paradigm irrevocably. The silos in which research and development were ensconced have become flattened, replaced by a horizontal paradigm that accommodates

ideas and information gathered from a potentially infinite variety of sources across the product lifecycle spectrum. As *The Economist* recently noted, “Old-fashioned R&D is losing its ampersand.”

What has risen from the dust of past methods is a world revolving around communities of interest, where virtually all stakeholders with a vested interest in nurturing innovation – including research scientists, academics, corporate product managers, third-party providers, and even customers – exploit the same kinds of social and professional networks popularized by entities such as MySpace and LinkedIn.

According to Burt Kaliski, director of EMC’s Innovation Network (See sidebar, “Innovation by association”), the social dimension of this philosophical sea change is just as important as the technical, economic, and professional forces that enable innovation. “At one point, the prevailing wisdom was that technology would isolate people,” notes Kaliski. “Nothing could be further from the truth. The ability to discover shared interests with researchers you’ve never met – and cultivate those interests using increasingly sophisticated tools, such as wikis, blogs, and RSS feeds – enables the crossover of information that you need to develop innovative solutions in response to complex, real-world challenges. Substantive interactions that were once limited to a few annual industry conferences are now occurring 24/7.”

### GOODBYE, IVORY TOWER

As the traditional silos of research and development have toppled in the wake of new approaches to innovation, so has the notion of the ivory tower. The ability to break down the traditional barriers between academic, governmental, and commercial pursuits has yielded exciting opportunities for leading researchers such as Dan Boneh, associate professor of computer

## Foiling phishers

A key participant in the EMC Innovation Network is Stanford University, which has a history of collaboration with RSA, the Security Division of EMC, and with government agencies such as the Department of Homeland Security. These initiatives have included a number of anti-phishing projects, such as PwdHash, which helps thwart the efforts of would-be phishers by converting user passwords into “hashed,” domain-specific passwords that are useless to perpetrators of phishing scams.

For more information on Stanford’s anti-phishing initiatives, visit: <http://crypto.stanford.edu/anitphishing>

## Innovation by association

In recognition of the IT industry’s focus on promoting innovation through technology-driven models of collaboration, EMC recently announced the formation of the EMC Innovation Network, a global community that links the company’s research and development resources with university research partners and key customers. The EMC Innovation Network uses blogs, wikis, instant messaging, videoconferencing, secure domains, and EMC’s own e-room technology to support worldwide collaboration on research projects. These efforts will fuel the exploration, discovery, and application of new technologies that will help shape the future of information infrastructure.

To learn more about the EMC Innovation Network, visit: [www.emc.com/news/emc\\_releases/showRelease.jsp?id=5064](http://www.emc.com/news/emc_releases/showRelease.jsp?id=5064)

science and electrical engineering at Stanford University. (See sidebar, “Foiling phishers.”)

For Boneh, the ability to couple Stanford’s research efforts with real-world trends in commerce and government plays a significant role in his department’s efforts to recruit the best and brightest graduate students. “When we conduct workshops on security-related issues with researchers from RSA and the Department of Homeland Security, we’re not getting together to ponder abstract questions,” Boneh explains. “We’re identifying those areas where Stanford’s research can yield concrete, commercially relevant benefits for our partners.”

The fact that Boneh’s research focuses on online security adds an additional note of urgency to his endeavors. “One of the goals of our research is to make it impossible for perpetrators of malevolent attacks to benefit financially from their activities,” he explains. “Our collaborations with corporations, government agencies, and other institutions don’t just create tantalizing research projects that help us attract brilliant students. They also provide us with the front-line information we need to deliver innovations that enable us to stay a step ahead of the attackers. In doing so, we also help preserve consumers’ confidence in the online systems that they use to transact, and in the information infrastructure as a whole.”

In 1624 John Donne wrote, “No man is an island”; a 21st-century corollary might be, “No innovation without collaboration.” From the groves of academe and the halls of government to the laptops of tomorrow’s entrepreneurs and the boardrooms of visionary enterprises, the connective tissue of the global information infrastructure continues to yield new methods for rapidly transforming the diverse perspectives of creative thinkers into innovative results.

**“OUR COLLABORATIONS** with corporations, government agencies, and other institutions provide us with the front-line information we need to deliver innovations that enable us to stay a step ahead of online attackers.”

### Dan Boneh

Associate Professor  
Computer Science and  
Engineering, Stanford  
University

The March 2007 IDC white paper, “The Expanding Digital Universe,” generated a lot of interest in the IT community. *ON* asked Jeff Van Houten, senior vice president and advanced technology manager at New Orleans-based Parish National Bank, for his take on the information growth issues highlighted in the white paper.

## The Information Growth Interview

**ON: IDC predicts that the amount of information created and replicated annually will grow more than six times over the next four years. What are the key drivers of information growth in your organization?**

Several factors contribute to our data growth: replication of critical data, acquisition of new services, and the dramatic growth in our customer base over the last two years.

We have a data- and processor-intensive marketing model that

involves analyzing every customer transaction every two months to determine customer profitability.

Another key driver is acquisitions, which has led to our having an insurance group, mortgage originators, and an investment/securities unit in addition to our core banking business.

Technology convergence also plays a role: VoIP and data from digital video recording cameras have put more demands on our infrastructure. Other drivers include increased data retention to comply with regulatory mandates.

Will we experience a 6x growth? That will depend upon how successful we are in implementing ILM (information lifecycle management) strategies, which can mitigate the effects of data growth.

**What is the impact of consumer-generated content on your organization?**

We’re already dealing with heavy, consumer-created imaging content associated with consumer loans, mortgages and property appraisals, and our storage infrastructure is the repository for all of it. As the data continues to grow, storage will become only more critical.

More than consumer-

generated data, online banking has impacted the role of IT. Everything is more time-critical because a bank’s interaction with its customers increasingly takes place online. Reliability and timeliness of access are of key importance in ensuring a good customer experience.

**How do you manage the growth of unstructured data in your organization?**

The “last-touched” principle will prevail in most cases where any data that has not been used in a certain time period gets moved to less expensive storage. However, applications with built-in ILM functionality will make it easier for us to streamline the movement of data across different tiers.

**How does IT help create new value and new business opportunities?**

We provide the right technology tools, consulting, and integrations services for our internal customers. IT’s job is to deliver data consistently, and our internal customers decide how to use that data to grow the business in their functional areas.

**How do you promote the effective and efficient use of information?**

In financial services, most

actionable information resides in a defined set of applications, such as interest accrual, reporting, etc., so the application selection process is critical. Collaborating with internal customers in the application acquisition decision can have a profound, positive effect in getting the right solution in place. And finally, ILM will ensure information generated by these applications will be stored in the optimal, most cost-effective repository.

**What role does—or could—an information infrastructure play?**

We’re continually integrating new functions into our information infrastructure as it covers a broader cross section of our enterprise. Over time, more applications and data—whether that entails VoIP, data from our security surveillance cameras, integrated alarms/alerts, or even the time clock on the vault—will be added to that infrastructure and depend on its reliability. The more information that is poured into our infrastructure, the more reliant we become on its ability to serve up data in the most reliable and cost effective way possible.



## Bring On The Exaflood! BY BRUCE MEHLMAN

AND LARRY IRVING Electricity reached one-quarter of Americans 46 years after its introduction. Telephones took 35 years and televisions 26 years. Already, in just six years, broadband has reached 25 percent penetration, according to McKinsey & Co.

The exponential explosion of digital content on the Internet is striking. YouTube alone consumes as much bandwidth today as the entire Internet consumed in 2000. Users upload 65,000 new videos every day and download 100 million files daily, a 1,000% increase from just one year ago. The market research firm IDC predicts that this year the amount of information created will surpass, for the first time, the storage capacity available. Those fearing a bandwidth shortage are taking preemptive actions, such as the Defense Department's recent cutoff of soldiers' access to content-rich sites such as YouTube and MySpace.

Driven by a critical mass of fast connections and the arrival of a "killer application"—video—broadband has arrived. Broadband, or high-speed Internet connectivity, is the transformative technology of our generation. Access to and effective use of broadband affects the ability of individuals, industries and nations to grow, compete and succeed. If we can match the explosion in digital content with the smarter and more robust networks needed to get information to homes, businesses and schools, America stands a good chance of regain-

ing its global leadership in broadband access, innovation, and adoption.

Yet as new content proliferates, today's high-speed connection could be tomorrow's traffic jam. The strain on broadband capabilities and the looming data deluge is often called the Internet exaflood. "Exaflood" stems from the term exabyte, or 1.074 billion gigabytes. Two exabytes equal the total volume of information generated in 1999. The Internet currently handles one exabyte of data every hour. This mushrooming amalgamation of data is pushing the Internet to its limits.

We should not fear the exaflood, however. It is key to the innovative new services and applications that appear almost daily. Consider the growing number of universities that are making course lectures available online, often in real time. Or telemedicine programs that are transmitting medical images and linking patients with distant specialists for real-time consultations.

Preparing for the exaflood is critical to the nation's success. The Internet infrastructure must be robust enough to handle all of the new data; this is often a challenge because the Internet is really thousands of privately

owned, individual networks stitched together. It requires constant investment so that it will continue to grow and run smoothly. The private companies that maintain the Internet backbone are continually upgrading the network with new computers, routers, fiber optics, and software to make sure data get where they need to go as fast as possible.

All sides agree that we need ongoing investment in content, massive upgrades of infrastructure, and relentless innovation to handle the phenomenal growth in data traffic. We need advancements in how we build and operate networks, including new file compression technologies, upgraded traffic management software, better spam and virus filters, and new delivery platforms. And we need substantial investments in short-haul bandwidth through fiber to homes, broadband over power lines, satellites and fourth-generation wireless networks.

The formula for encouraging such extraordinary investments is clear: Minimize tax and regulatory constraints and maximize competition. Policymakers across the nation have ample opportunity to implement this blueprint right away.

They should pass common-sense legislation such as permanently extending the Internet tax moratorium, building broadband-ready public housing, and cutting depreciation schedules for network equipment and infrastructure.

The price of maintaining the status quo would be Internet gridlock that cripples new services, and our country would fall further behind other countries in broadband penetration.

The impending exaflood of data is cause for excitement. It took two centuries to fill the shelves of the Library of Congress with more than 57 million manuscripts, 29 million books and periodicals, 12 million photographs, and more. Now, the world generates an equivalent amount of digital information nearly 100 times each day. The explosion of digital information and proliferation of applications promise great things for our economy and our nation, as long as we are prepared.

◆◆◆ Larry Irving and Bruce Mehlman are co-chairs of the Internet Innovation Alliance. Both have served as Assistant Secretary of Commerce.



**THE INFORATI FILES** Imagine everything we know in one place. Jimmy Wales, Cofounder of Wikipedia, not only imagines it, he's working on it.  
*By Tim Devaney and Tom Stein*



**JIMMY WALES** has set himself the goal of accumulating all human knowledge in his online encyclopedia. And he says he's getting close, at least in the English-language version, where there are now nearly two million articles.

Of course, Wales has a lot of help. Anyone with an Internet connection can contribute to Wikipedia, which is how the site has built a library of six million articles in 250 languages with just seven paid administrative employees.

Wales is bringing his all-comers approach to search. This year he'll launch Search Wikia, an open-source search engine built and fine-tuned by users.

Do we really need another search engine? Wales thinks so. Search as it stands now is a cipher. Where do the results come from? Who decides how they're ranked? "As citizens of the Internet we should be concerned about how much of a black box search is," says Wales.

**Talk about Search Wikia. Why do we need something besides Google?**

I want a completely open-source search engine with all the algorithms published, so people can see why things are ranked the way they are.

**And it's users who will do the ranking?**

They're one component. Human intelligence and human editorial oversight is incredibly powerful. But there's also got to be an algorithmic component, simply because you'd never be able to sort by hand everything anybody might search.

**Is information better if it's mediated by people or is it just valuable in a different way?**

It's too early to say confidently that we'll be able to produce better-quality search results. But compare searches from Google, Yahoo, and Ask. They're all very similar. We've reached a plateau in search and to break beyond it we need to think in new ways.

**You've said you imagine a day when everyone on the planet has access to the sum of all human knowledge. Is that the goal of Wikipedia?**

That's always been our core mission. We still have a long way to go but we're optimistic.

**How much bigger does Wikipedia have to get to reach your goal?**

I think we're there, at least in terms of the English Wikipedia. Obviously there are lots of quality improvements to be made and still plenty of things to be written about. But we have a free high-quality encyclopedia.

**Why are people so generous with their time at Wikipedia?**

It's fun. It's an intellectual hobby. It's interacting with other people, trying to do something useful for the world. People just enjoy it.

**Web 3.0: What's that going to be?**

I'm a little skeptical that term has any meaning. As soon as Web 2.0 became all the rage as a term, people started saying, "Ah! What about 3.0?" I have no idea.

**What's the first time you understood the power of information?**

When I was a kid and I was a voracious reader. At a very young age I was into knowledge and information.

**How do you manage information? Are you a gadget guy?**

Not really. I do have a Sidekick and I am on IM a lot. Mostly I'm just buried in volumes of e-mail. I think e-mail is completely broken and I don't know what the world's going to do about it. Maybe Web 3.0 will be about making e-mail not suck again.

**Do you have any information heroes?**

Larry Lessig, the Creative Commons guy. A couple years ago he declared e-mail bankruptcy. I admire that very much. He deleted all his e-mail one day and put out an announcement: "E-mail bankruptcy. If you sent me something, I didn't read it. I deleted it. So start over again." That was pretty impressive.

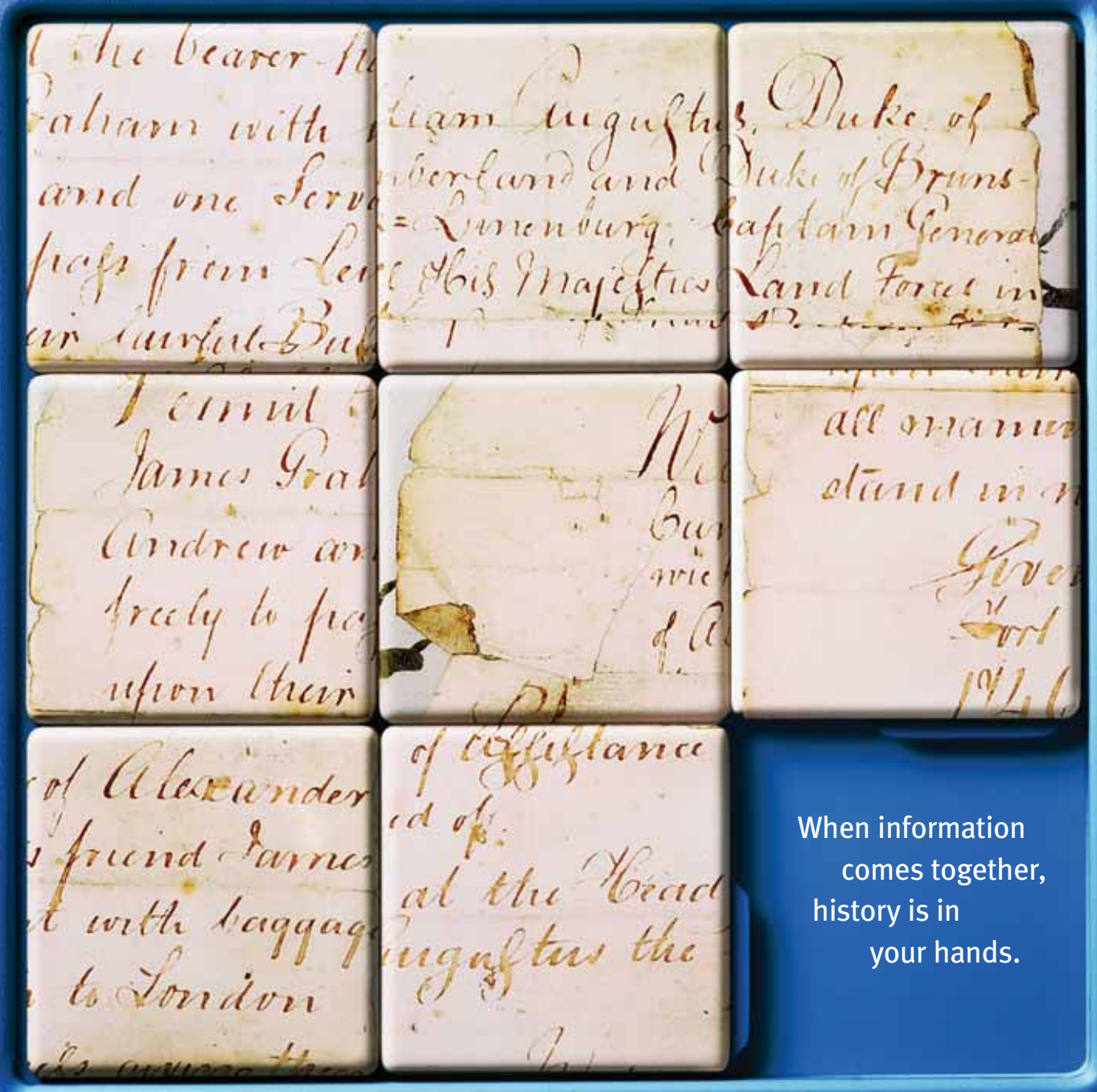


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