The Way of the Web

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The information explosion of the last two decades has left many philosophers and pundits bemoaning the fact that we have been compiling and storing vast quantities of data like an army of mad squirrels but have had no meaningful way to access those data. These same pundits point out (with my apologies to the editors of this fine publication) that the publication process has not radically changed since the printing press was industrialized in the last century. The Internet was introduced in the 1970s mainly to enable academics and scientists to access information through an international network of computers. But finding information on the Internet, even with specialized search software such as gopher and WAIS (Wide Area Information Search), was often like finding a needle in a haystack.

In the last five years, all of that has changed with the creation of the World Wide Web—a subset of computers on the Internet communicating via a new protocol known as HTTP (HyperText Transfer Protocol). Today, almost anyone with a computer, a modem, and an Internet connection can have virtually instantaneous access to information, graphics, and multimedia through links with computers all over the world. Increasingly, the Web is becoming an important tool for the government and for public health providers. This article explains why.

What Is the Web?

While the Internet has existed for decades, about five years ago, Tim Berners-Lee (at that time a graduate student in physics and now Director of the World Wide Web Consortium at the Massachusetts Institute of Technology) developed a technology that allows an author working on a computer to embed links in a text which can take a reader to other points in the same document or to other documents. The linking is accomplished by developing documents (or "pages") in a format called HyperText Markup Language (HTML). HTML allows an author to combine text, images, and multimedia files and to embed the Internet addresses of other resources he wishes the user to be able to access. The Web takes this concept of linking to its logical extreme—from one document on the Web, the user can instantaneously be connected to any other document or resource on the Web through the simple clicking of a computer key, button, or mouse.

By creating documents and placing them on a Web server (a computer attached to the Internet that can "serve" documents in response to the requests of individuals using "web browser" software to access the Web), one can present information in an attractive, organized, and logical fashion to computer users anywhere in the world. As a result, vast amounts of data and collections of documents that have previously been hidden away in paper archives can be made available fairly easily, at low cost, and in a user-friendly manner.

So, in the last few years, owners of data have been handed a magic lamp that allows them to make their data available to anyone in the world—and there has been a headlong rush to do so. Digital Equipment Corporation's Web search service, Alta Vista, recently reported that it had indexed more than 30 million Web pages located on more than 200,000 servers. Those Web pages have been developed by individuals, organizations, businesses, and government agencies—many of them public health-related.

For a field such as public health, where so much hinges on providing easily accessible information in an

Getting There

To reach any Web site, you will need an Internet connection—available to those with computers on networks with connections to the Internet and to those with modems connected through a commercial service such as America Online or Compuserve or to a private service provider—usually available at a cost of less than $20 per month. To reach a specific Web site, log on to the Internet, activate your Web browser software (Netscape and Mosaic are the two most commonly used) and, at a place indicated on your screen, type in the address of the site you wish to access. To reach the Administration on Aging home page, for example, you would type in "http://www.aoa.dhhs.gov." Then hit your enter key, or (depending on which software you are using), click a word such as "go."

Up will pop a page, with pictures and words. If you click on particular icons (pictures) or words known as "hotlinks" (which appear in blue in most browsers) with your mouse or a computer key, the original page will be replaced with a new page or document to which you have linked. Another way to reach a site is by typing in a keyword such as "aging" on one of the numerous Internet search indices like Yahoo! (http://www.yahoo.com) or Alta Vista (http://www.altavista.digital.com) that are freely available. A search will yield a list of many sites relating to aging; by scrolling through the list until you reach the entry for the AoA, placing the cursor on the provided link, and clicking your mouse or computer key, you will be linked with the AoA home page.

essentially private fashion, the Web is an outstanding medium for dissemination. Major advantages of the Web are its capacity to offer a wide range of information to users in geographically remote or underserved locations, its relatively low costs, the increasing simplicity of its use, and its streamlining or reengineering of certain complex and costly government processes.

A Brief Tour of Public Health Sites

A quick visit to the Web site of the Administration on Aging (AoA) shows the variety of information that can be presented on a single topic. Within seconds of your arrival at the AoA's Internet address, http://www.aoa.dhhs.gov, you will find statistical data for researchers, clinical information aimed at elderly consumers as well as valuable directories identifying local points of service, an outstanding listing of other aging-related Web sites, and documents outlining Federal policy on aging.

The Office of Disease Prevention and Health Promotion (ODPHP), which can be visited on the Web at http://odphp.osophs.dhhs.gov, offers a number of policy and consumer-oriented documents including an entire site dedicated to its Putting Prevention into Practice program. ODPHP also funds the National Health Information Center (NHIC) and its Web site at http://nhic-nt.health.org, which includes select health pamphlets for consumers that can be viewed electronically.

On the Department of Health and Human Services (HHS) home page (http://www.os.dhhs.gov) you will find that Departmental Appeals Board decisions are now freely available and searchable. You will also find links to home pages for all the agencies within the department (including the Food and Drug Administration and the Centers for Disease Control), a searchable database of policy studies conducted by the Department, a list of consumer health information available on the Web, home pages for offices such as the Office on Civil Rights and each of the Assistant Secretaries, and pages devoted to displaying the wealth of statistical and policy-related information developed over the years by the department. Go take a look—the amount and variety of information available on this one page is truly amazing, and other resources are being added as time and resources allow.

A Sampling of Public Health Web Addresses

Administration on Aging
http://www.aoa.dhhs.gov

Agency for Health Care Policy and Research
http://www.ahcpr.gov

Bureau of Maternal and Child Health
http://www.os.dhhs.gov/hrsa/mchb

HHS Forms Distribution
http://aosweb.psc.dhhs.gov/forms

National Health Information Center
http://nhic-nt.health.org

National Institutes of Health Clinical Center
http://www.cc.nih.gov

Office of Disease Prevention and Health Promotion (ODPHP)
http://odphp.osophs.dhhs.gov

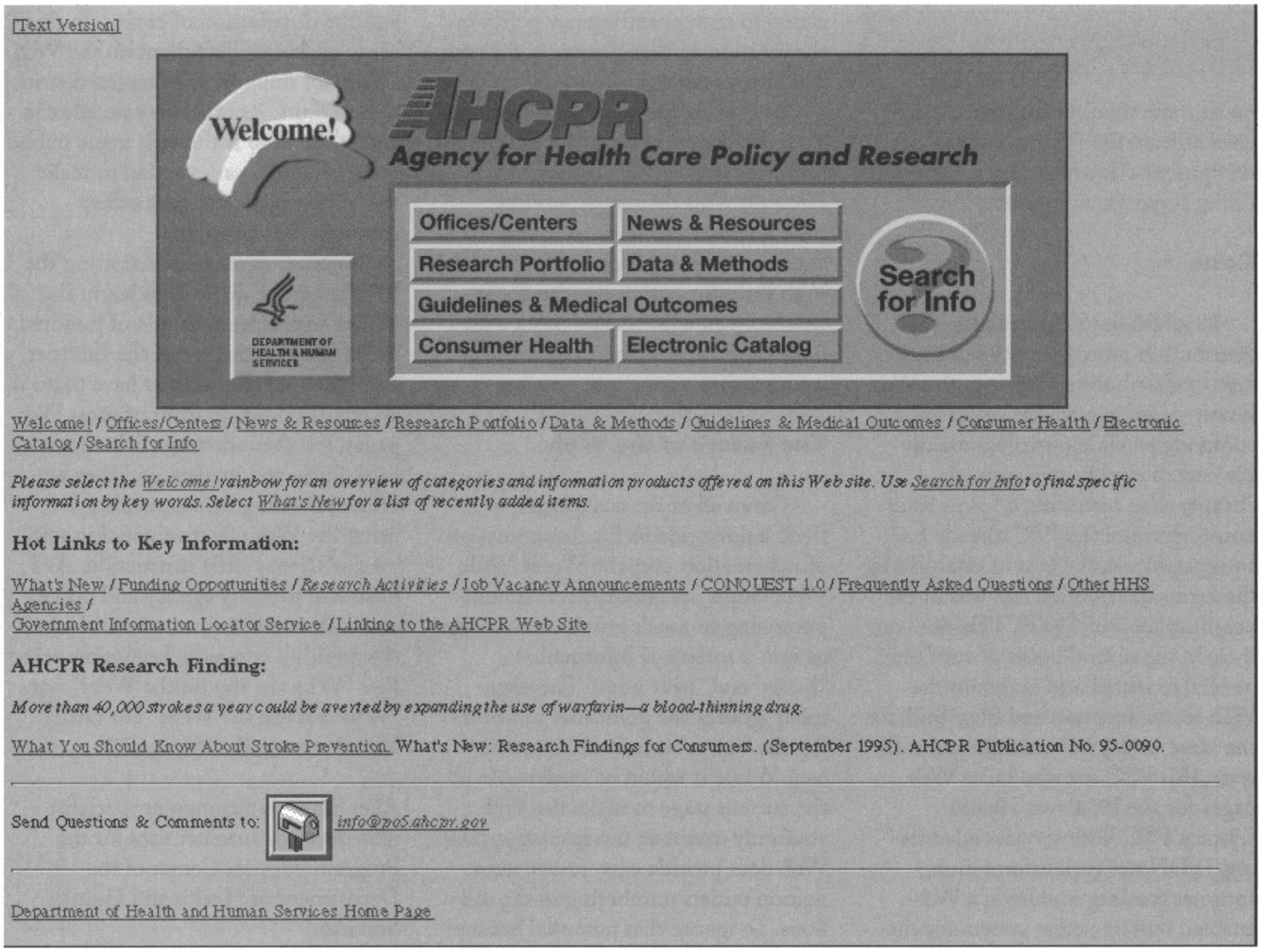
Program Support Center
http://www.os.dhhs.gov/psc

Advantages of the Web

The Web is increasingly being used by public health agencies and offices in large part because it offers a relatively easy, inexpensive way to provide important, current, easily accessible information. Developing documents for the Web is fairly easy at the basic level. HTML is the lingua franca of the Web. A number of word processing programs now allow users to generate basic HTML documents, and Web site authoring programs (such as MicroSoft's FrontPage and Ski Soft's Web Publisher) allow the user to create basic Web pages without typing in any HTML commands. (To create more sophisticated pages that might include such high tech elements as animation or interactivity, professional expertise may be required.)

The simplicity of "webbing" documents means that content can be kept absolutely current by simply replacing outdated files with updated versions. Once a file has been replaced, the next person to access the site gets the new information. Compare this with a paper-based publication-and-distribution cycle measured in months or years, and the advantages of publishing on the Web are immediately apparent: a clinical center can provide accurate operating hours, a health agency can suggest up-to-date treatment procedures for practitioners, and a grantor can tell potential grant applicants that a deadline has been extended.

The user-friendliness of HyperText documents can be shown by the fact that if this article were on the Web, I could have made three links in the preceding sentence. These would have taken you to the Web pages of the National Institutes of Health Clinical Center (http://www.cc.nih. gov), the Agency for Health Care Policy and Research (http://www.ahcpr. gov) Clinical Practice Guidelines, and the Maternal and Child Health Bureau's (http://www.os.dhhs.gov/ hrsa/mchb) Grants Guidance page to illustrate each item mentioned. At the MCHB site, you would have found another



innovation: links that allow users to download the forms and instructions needed to apply for grants.

Process Reengineering

This brings us to another important advantage of the Web: changes in how some business is conducted—or process reengineering. Until this year, potential grantees for MCHB's grants would watch the *Federal Register* for announcements of grants, then mail or phone in requests for instructions and forms. MCHB would then mail copies of the documents to the grantees, a time- and resource-intensive task with considerable opportunity for error at each step.

In the last six months, MCHB, with support from the Program Support Center (PSC) of the Department of Health and Human Services (HSS), has created a one-stop grants application page, on which users can see which grants are currently available and download the necessary information and forms onto their own computers. Once the MCHB staff has prepared the information and forms and the Web page has been modified to provide access, the MCHB staff need not intervene until the forms are mailed to the Bureau.

The use of downloadable forms signals a radical change in the distribution process for government forms. The HHS Forms Distribution Page (http://aosweb.psc.dhhs.gov/forms) gives users access to 150 HHS and other agency forms in three print-ready formats. The objective is to avoid keeping large supplies of forms on shelves in warehouses, with the concomitant requirements and costs of shipping, taking inventory, and disposing of obsolete materials.

The site represents a conjunction of efforts. This spring, PSC's Electronic Phototypesetting Section (EPS) had begun to develop these print-on-demand forms when the PSC created a Web page that lays out the forms in tables, giving the form's title, number, and revision date and providing icons to click on in order to download the forms from an FTP server. Users receive a form that, when printed on the user's own laser-quality printer, is indistinguishable from the original. Users can produce as many copies (or as few!) as they need.

Technology will soon be available to let users download a form, fill it out online, and submit their information electronically without using any paper. In addition, the PSC will soon have an experimental page available

on this site to allow users to experience at least the first two stages of this process: downloading a form and filling it out via computer.

Costs

In addition to streamlining the distribution process, another advantage to distributing forms via the Web is cost: running a couple of personal computers—which involves mainly the cost of electricity—is much cheaper than operating a forms warehouse. Because the PSC already had Internet access, the cost of establishing the forms distribution site was in the neighborhood of $2000. This does not include the several hours of staff time needed to install and maintain the Web server software and files. Still, for the same outlay in hardware and software, this PSC site also hosts Web pages for the Parklawn Health Library, PSC Web services advertising, ISDN network information, Internet training resources, a Web-enabled remote access system for the PSC's local access network e-mail system, and a Web-enabled discussion group system. The server is nowhere near its capacity. To develop all of these sites, the PSC used two used desktop computers, some software we already owned, and some shareware downloaded from the Internet.

If you would like to put up a Web page but have no Internet access or do not wish to establish a server of your own, a phone line and a modem can connect you to an Internet service provider (ISP) for access to the Web, and many ISPs will also sell you space and access on their Web servers. Prices of $25 a month for 15 megabytes of space (enough for a good-sized Web site) are common. Such an option would be technically feasible for a government program as well, but most if not all agencies now have at least one, and usually many, Web servers. Within the Federal government, systems staff have information regarding access to servers and agency policy on the creation of Web presences for particular programs.

To make users aware of new sites, Web developers can register new Web resources (the process takes about 10 minutes) with the search services mentioned in the accompanying box and others. Then, users searching the Web for information on your topic will be given a list of Web sites with links they can click on to get to your information.

The Future of the Web

Given all of the advantages, is there a downside to the dissemination of information over the World Wide Web? Some are concerned that computerizing so much information makes us into a society of information "haves" and "have nots." This argument ignores the point that multiplying the "haves" is in itself a worthy end. While it would be inadvisable at the current stage to make the Web your only means of dissemination, the Web does provide easy-to-use information outlets numbering in the millions. To ignore that potential because it does not provide universal access is surely an error.

What is more, even users without direct access to the Web can benefit. One way in which this occurs is through the printing out of Web pages and the distribution of copies. In this sense, placing a document on the Web allows for millions of potential distribution points. Another way people can access the Web is through many public libraries, and there is a plan to make the Web available at post offices throughout the country.

Another concern is that using the Web might be difficult to learn. But having instructed a couple of hundred individuals on the use of the Internet, I can now say that all you have to do is sit novices down in front of most Web pages, tell them how to click on buttons, links, and images, and they are off and running. Most people are using the Web effectively within minutes, with very little instruction. As I have said to many agency and office customers over the last year and a half, the question is rapidly becoming neither "Why are you on the Web?" nor "Why not use the Web?" but rather "Aren't you on the Web yet?"

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Health Statistics on the White House Home Page

The National Center for Health Statistics is serving as a facilitator for the health component of the Social Statistics Briefing Room, now featured on the White House Home Page on the World Wide Web. This briefing room was established, along with the Economic Statistics Briefing Room, to provide Internet users with a centralized location on the Web to find Federal statistics. By visiting these briefing rooms, users can gain direct links to the specific Federal agencies that collect these data. Other categories in the Social Statistics Briefing Room include crime, demography, and education. The health component is updated monthly and currently features six topic areas: vital statistics, use of health services, prevention and risk, health status, reportable diseases, and health care expenditures. Users can reach the White House Home Page and the Federal Statistics Briefing Room at <http://www.whitehouse.gov/fsbr/ssbr/html>.