Berners-Lee, Tim

1955 –
World Wide Web Inventor

A quiet, modest Englishman with training in theoretical physics, Tim Berners-Lee brought the Internet to the masses in 1991 after creating the definitive window through which to view cyberspace, then campaigning tirelessly to assure that everyone who wanted to access it could do so for free. Given the scope of the World Wide Web and its potential to transform human communications, the impact of Berners-Lee's invention has been likened to that of Gutenberg's movable-type printing press.

Presumably, Berners-Lee could have become a wealthy man had he leveraged his innovation in a commercial enterprise—the way that Marc Andreesen did, for example, when he devised and marketed an improved Web browser (which itself was another Berners-Lee invention). But Berners-Lee resisted making the Web a proprietary venture like America Online or Compuserve, demanding instead that his creation remain universally accessible to anyone with Internet access. In 1994, he helped to ensure that it would remain a free space by forming the World Wide Web Consortium (W3C), a global body comprising major software makers, hardware manufacturers, academics, and politicians that suggests standardized specifications for Web technologies so that the medium can continue to grow as an "Internet commons." Today, Berners-Lee earns a modest salary as W3C director at the group's Massachusetts Institute of Technology (MIT) headquarters, content to allow others to grow rich from his creation.

"I am convinced that he does so not only from a desire to ensure the Web's future," wrote Michael Dertouzos, the late director of MIT's Laboratory of Computer Science, in a forward written for Berners-Lee's memoir, Weaving the Web. Berners-Lee also declined to exploit his invention for material gain, Dertouzos wrote, because of his "wellspring of human decency," which he found "even more impressive than his technical prowess."

Background

Berners-Lee was born in London in 1955. His parents, Conway and Mary Berners-Lee, were mathematicians who met while helping to build England's first commercial computer, the Ferranti Mark 1, at Manchester University. Mathematics and computers were common household discussion topics; as a child, Berners-Lee once built a model computer out of cardboard. His parents were enthusiastic about their work, although they also knew well the limitations of machines; namely, computers were incapable of making random associations between objects and concepts the way that humans can.

One day after school, Berners-Lee's father discussed this problem with him while preparing a speech for his boss to deliver. According to Weaving the Web, Conway Berners-Lee was struggling to think of ways to make computers intuitive. It was an important dilemma that would stick in his son's head.

Berners-Lee excelled in school, and graduated in 1976 with first-class honors in theoretical physics from Queen's College at the University of Oxford. While there, he made his first computer, using a soldering iron, an M6800 processor, and an old television set. After leaving Oxford, he worked for two years with a U.K. telecommunications company on distributed transaction systems and message relays, after which he worked at a company that produced typesetting software for printers. Eventually, he became an independent consultant, and in 1980, he found himself in Geneva, Switzerland, at the European Particle Physics Laboratory (CERN). While there on a six-month contract, Berners-Lee produced for his personal use the precursor to the World Wide Web, a program called Enquire. The name is short for "Enquire Within About Everything," which was the name of a Victorian-era book on manners he'd once read. "I didn't use the book," he told How the Web Was Born authors James Gilles and Robert Cailliau, "but that title stuck."

Berners-Lee used Enquire mainly to document programs he was writing for CERN. Enquire, which was constructed to help him find information about the concepts, people, things, and software that went into creating his programs, was capable of arranging information so that random associations could be drawn among the various data. It was not built on a hierarchical menu system, the way most programs were at the time (and as online programs like Gopher were later constructed). Instead, Enquire allowed information to be structured arbitrarily, a feature that Berners-Lee said might make it possible for users to find information they didn't even realize they were looking for. This structure became the basis for the World Wide Web.

Creating the Web

Berners-Lee left CERN in 1980 but returned in 1984 to work on information- retrieval systems for the lab. This time he faced a daunting problem: CERN was a huge research installation where many scientists worked on short-term fellowships, with many people using many varieties of computers and storage formats. Researchers frequently produced work on their own terminals, but were unable to share it with colleagues. Even worse, important physics research was often lost, as it was prepared on various outdated computers and stored on outmoded disks, and the data could not be retrieved, or sometimes even located. Berners-Lee's task was to create a system that would allow all of CERN's computers to share information unencumbered. In 1989, he proposed

a decentralized hypertext project that could resolve all those problems—and that, in fact, could also connect CERN's computers with computers outside the lab, or even across the planet. His prospectus outlined the bare bones of the World Wide Web.

Although his proposed project received little attention from his colleagues at the time, Berners-Lee was determined to create it on his own, using CERN's resources and enlisting whomever he could to help him. Berners-Lee had one key ally within CERN; Robert Cailliau, the Belgian-born head of CERN's Proton Synchrotron system software group, became Berners-Lee's lead collaborator, lending the Web project much-needed credibility within the organization.

Credibility was needed because the Web project had become Berners-Lee's sole focus at CERN. He lived in constant fear that a superior might pull the plug on his "universal hypertext system," since it had little direct connection to particle-physics research. (In fact, several years later, CERN did bar all non-physics-related projects.) Cailliau played a key role in helping Berners-Lee to promote the wonders of the Web during the first four years of its existence, a period that Berners-Lee calls its "phase of persuasion." Part of his challenge was to keep portraying the system as a way to help CERN to organize and distribute its internal information, even though he was well aware, from the time of his initial proposal, that the Web had global implications, both for text and multimedia applications.

At CERN, the Web was promoted as a way to allow researchers to work together by combining data using a web of hypertext documents. To that end, working on a high-end NeXT computer, Berners-Lee wrote the code for the first Web server, which he called "httpd," beginning in October 1990; it was based on the hypertext transfer protocol that he'd also created. He then wrote code for the first browser, which he called "WorldWideWeb," the name that he eventually bestowed on the whole project. By December 1990, he had submitted the browser to his colleagues at CERN, initially selling it as telephone-book database. Response within the lab was lukewarm; even with Cailliau's persistent lobbying for more resources, the duo never quite received from CERN what they felt was necessary to make the Web project fly.

Going Public

In August 1991, Berners-Lee made a critical move. Realizing that he wasn't going to get what he needed from CERN, he decided to produce what Cailliau referred to in How the Web Was Born as a "toolkit," which would allow other developers outside CERN to contribute to the project. He released the WorldWideWeb browser to the Internet, along with a second, simpler "line-mode" browser developed by student assistant Nicola Pellow, and the Web's first basic server, allowing anyone who wanted to try the system to download it for free, and to modify it to their own liking. Then he announced the release on newsgroups, including alt.hypertext, where hypertext enthusiasts and key members of the academic community congregated.

The public began to take notice of the Web, slowly at first. In July and August 1991, there were between 10 and 100 page views on the info.cern.ch server every day. Between then and 1994, the load on that first Web server rose by a factor of ten each year. Gradually, developers on the nascent Web began to introduce new browsers that were compatible with systems other than that of NeXT, which was an expensive computer that was not popular with consumers. By January 1993, there were some 50 servers on the Web, and there were a number of new browsers with names like Erwise, Viola, Cello, and Samba.

In February 1993, a team from the National Center for Supercomputing Applications in Champaign, Illinois introduced the first version of Mosaic, the precursor to Netscape. It was the easy to download and install, had a simple-to-use point-and-click interface, and could display photographs and images along with text on Web pages. To the public, Mosaic was a revelation; it was suddenly clear what the Internet was capable of. The press began to take notice, and the Web took off like a shot; by 1994, there were 100,000 servers on the Web.

Given its core mission, CERN was the wrong place for the Web to be tied to. In 1993, Berners-Lee convinced officials at the lab to release the underlying Web technology to the public domain —which meant that he was also scrapping his idea of having the system licensed under the General Public Licensing scheme. While this idea would have allowed the software to be distributed freely, it would also have attached some proprietary strings. He had already abandoned the idea that he and Cailliau had batted around of starting a company called Websoft to market his invention, because that would probably have caused competitors and incompatible browsers to spring up, fracturing the Web and eliminating its potential as a "universal" hypertext environment. "He thought it better to stay above the fray and try to bring technical harmony," Time magazine reported.

After traveling around Europe and the United States gathering input on what was needed to keep the Web stable, Berners-Lee formed the World Wide Web Consortium, with the assistance of MIT's Dertouzos, in October 1994. Among its current 500 members, the W3C.org site says, are technology and product vendors, content providers, corporate Web users, research labs, standards-making bodies, and governments. All work to achieve consensus on the direction that the Web should take. Berners-Lee retains great power over its development, although most members say that he declines to exercise that power; still, according to Scientific American magazine, each W3C member must sign a contract giving Berners-Lee the final say in any new Web

specifications. Since its inception, the W3C has developed more than 35 new technical specifications for the Web, ranging from the eXtensible Markup Language (XML) and cascading style sheets to scalable vector graphics (SVG) and the Synchronized Multimedia Integration Language (SMIL) specification.

In recent years, Berners-Lee has turned his attention to Web improvements that he calls "the Semantic Web." A Semantic Web will bring structure, he says, to "the meaningful content of Web pages" by "creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users." The new Semantic Web is rooted in notions of human-computer interaction.

"Once the (Semantic Web) dream is reached," Berners-Lee wrote in Weaving the Web, "the Web will be a place where the whim of a human being and the reasoning of a machine coexist in an ideal, powerful mixture." As it develops and improves, Berners-Lee has predicted, the Semantic Web could come to resemble a kind of "global brain," with each of its human users and each machine worldwide representing individual neurons.

Berners-Lee created a medium that is used today for everything from buying cars and CDs to getting the daily news—and, in some places, voting for public officials. It has succeeded faster than practically any new-media technology before it. Today, the growth of the Web is synonymous with the growth of the Internet, although they are not in fact the same thing. In July 2001, Nielsen//NetRatings reported that there were 429 million people connected to the Internet globally. While many of them use the medium for instant messaging, chats, FTP, and other functions, virtually all of them also use the Web, and there is little argument that the Web has driven the Internet's growth to its current staggering proportions. "The Web and the Internet grew as one, often at exponential rates," Joshua Quittner wrote in Time magazine in 1999. "Within five years, the number of Internet users jumped from 600,000 to 40 million. At one point, it was doubling every 53 days."

Berners-Lee readily acknowledges his debt to innovators who came before him—notably Ted Nelson, the inventor of hypertext, and Doug Engelbart, whose 1968 oNLine System (NLS) was the Web's networking ancestor. As Dertouzos noted in his introduction to Weaving the Web, Berners-Lee's key epiphany was the realization that the two things that computer scientists had been fixated on for decades—hypertext and networks—belonged together.

What perhaps makes Berners-Lee stand out personally, aside from the overwhelming success of his creation, is his innate humanism, the insistence that his invention belongs not to himself, but to the world. By foregoing personal wealth in the interest of assuring that his invention remain stable, scalable, and available to all Internet-connected human beings, Berners-Lee turned a technical innovation into one of the great acts of philanthropy of the twentieth century.

Selected Works

Berners-Lee, Tim. "Information Management: A Proposal." In Multimedia: From Wagner to Virtual Reality. (Packer, Randall, and Ken Jordan, editors.) New York: W.W. Norton & Co., 2001. pp. 189-205.

Berners-Lee, Tim. "Bio." 1999. <http://www.w3.org/People/Berners-Lee/Longer.html> (April 16, 2002).

Berners-Lee, Tim and Mark Frischetti. Weaving the Web. New York, New York: HarperCollins, 1999.

Berners-Lee, Tim, James Hendler, and Ora Lassila. "The Semantic Web." Scientific American, May 2001, pp. 35-43.

Bibliography

Gillies, James and Robert Cailliau. How the Web Was Born. Oxford, England: Oxford University Press, 2000.

Holloway, Marguerite. "Molding the Web." December 1997, <http://www.sciam.com/1297issue/1297profile.html> (April 16, 2002).

Quittner, Joshua. "TIME 100: Scientists & Thinkers: Tim Berners-Lee." Time. 1999. http://www.time.com/time/time100/scientist/profile/berner-slee.html> (April 16, 2002).

Wright, Robert. "The Man Who Invented The Web." Time. May 19, 1997.

Further Reading

Auletta, Ken. World War 3.0: Microsoft and its Enemies. New York, N.Y.: Random House, 2001.

Dertouzos, Michael. The Unfinished Revolution: Human-Centered Computers and What They Can Do for Us. New York, New York: HarperCollins Publishers, 2001.

Fidler, Roger. Mediamorphosis: Understanding New Media. Thousand Oaks, CA: Pine Forge Press, 1997.

Naughton, John. A Brief History of the Future: From Radio Days to Internet Years in a Lifetime. Woodstock, N.Y.: The Overlook Press, 1999.

Schwartz, Evan I. "The Father of the Web." Wired. March 1997, <http://www.wired.com/wired/archive//5.03/ff_father.html> (April 16, 2001).

Segaller, Stephen. Nerds: A Brief History of the Internet. New York, N.Y.: TV Books L.L.C., 1998.

Related Topics

"As We May Think"; Englebart, Doug; HTML; Hypermedia; Hypertext; Interactivity; Interface; Internet; Linking; Nelson, Ted; World Wide Web; World Wide Web Consortium

—*Kevin Featherly*

Blog

The earliest blogs (short for "weblogs") were Web pages made up of short, regularly updated posts that usually included hypertext links to Web sites or to online news and information that caught the author's (or "blogger's") interest, attention, or imagination. As the practice of blogging caught on in the late 1990s, the genre expanded to include

online journals comprising topical entries about daily events, both public and private. The category has grown broad enough to include sites ranging from personal journals about college dorm life to the Drudge Report, which includes links to a variety of tabloid news and gossip items. Some sites are the product of one or two authors, while others incorporate the contributions of a group of bloggers. Weblogger Jorn Barger is generally credited with coining the term "weblog" to describe the emerging genre.

What unites the various blog formats is the fact that they provide a means of "pre-surfing" the Internet—a necessary function, perhaps, as the number of sites and the amount of information continues to increase. The blog format reflects the time-sensitive nature of the genre, featuring the most recent posts (often dated) at the top, with preceding posts following in reverse chronological order.

Blogs tend to express the interests and personalities of their authors, both through the choice of links and through the short (often sarcastic or witty) observations and summaries that accompany the links. Thus, a blog serves not only as a record of found links, but also as a way for visitors to rely on someone, whose distinctive personality and set of interests may resonate with theirs, to scout online content for them. In this respect, blogs formalize the process though which Internet users swap the URLs (Uniform Resource Locators) for interesting sites. However, rather than merely pointing to Web sites of interest, bloggers generally provide "deep" links to particular items within a site.

The existence of blogs predates the coining of the term. Weblogs first started appearing in the mid-1990s, as Web surfers sought ways to assemble the information they had garnered online. A site called "Links from Underground," authored by college student Justin Hall in 1994, is an early example of a site that shared assembled links with online visitors. An even earlier precursor was the National Center for Supercomputing Applications' "What's New" site, which served as a bulletin board of links on topics ranging from technical developments in networked computing to favorite sites for news, research information, and even culinary tips.

Until recently, it was relatively easy to keep up with the various bloggers and their respective personalities and interests. Rebecca Blood's online history of blogs notes that by 1998, one of the first lists of blogs included only 23 pages. Within a few years, however, the number of blogs had increased to the point where the Blogger Web site, which provides software for blog authors, boasted 150,000 registered users. As the trend continues to expand, readers may well need a meta-level of blogs to pre-surf the booming number of individual blogs. This proliferation reflects not just the broadening of Web literacy and access to the Internet, but also the media attention that blogs have recently received, as well as the development of free, do-it-yourself blog tools, including both Blogger and Pitas.

Originally deeply embedded in the Web-surfing culture and limited largely to those immersed in the online world (not least because early bloggers often worked in computer-related fields), blogs have gone mainstream with the advent of sites hosted by newspapers, including the San Jose Mercury News and the Minneapolis Star Tribune.

The proliferation of non-commercial blogs reflects the ability of the Internet (in its current incarnation) to offer an outlet for self-publishing to almost anyone with online access. Blogs provide a unique forum for self-expression, based not as much on conventional notions of authorship as on the ability to uncover, collect, and cobble together online articles, images, and information. In this respect, blog composition exemplifies Janet Murray's description of online authorship as primarily procedural in nature. Bloggers provide their readers with a series of links to compositions that are usually not their own, but which, by the very nature of their juxtaposition, express the individual or idiosyncratic online "voice" of the blogger. In this respect, they bear a certain resemblance to the practice of journalism, which relies on linking together facts, observations, and quotes that often are not original to the reporter. In both cases, the author's distinctive contribution resides mostly in research and arrangement; the crucial difference lies in the fact that blogs allow a far greater range interests to be expressed by a far more eclectic group of authors.

Bibliography

Barger, Jorn. "Weblog Resources FAQ." September 1999, <http://www.robotwisdom.com/weblogs/> April 3, 2001.

Blood, Rebecca. "Weblogs: A History and Perspective." September 7, 2000, <http://www.rebeccablood.net/essays/weblog_history.html> (April 4, 2001).

Frauenfelder, Mark. "Blogging; Weblogs." Whole Earth, December 22, 2000, p. 52.

Gallagher, David. "Popular Web Publishing Service to Get Some Help from Helix." The New York Times, April 16, 2001, p. C6.

Murray, Janet. Hamlet on the Holodeck: The Future of Narrative in Cyberspace. New York: Free Press, 1997.

Further Reading

Barrett, Cameron. "Anatomy of a Weblog." Camworld, January 26, 1999, <http://www.camworld.com/journal/rants/99/01/26.html> (April 10, 2001).

Kingston, Matthew. "Weblogs: an Annotated Bibliography." May 1, 2000, <http://www.hit-or-miss.org/bibliography> (April 10, 2001).

Lanham, Richard. The Electronic Word: Democracy, Technology, and the Arts. Chicago: University of Chicago Press, 1993.

Rhodes, John. "In the Trenches with a Weblog Pioneer." Webword.com, November 29, 1999, <http://www.webword.com/interviews/eaton.html> (April 11, 2001).

Related Topics

HTML; Linking; Virtual Community; World Wide Web

—*Mark Andrejevic*

Communications Decency Act

The Communications Decency Act (CDA) is a controversial bill passed by the U.S. Congress and signed into law by President Bill Clinton in 1996. It was an attempt by the federal government to address public concerns about pornographic material on the Internet. The U.S. Supreme Court overturned the law on June 27, 1997, in arguably the first landmark ruling in the history of the Internet.

U.S. Senator James Exon, a Nebraska Democrat who had been a two-term governor of Nebraska before his election to the Senate in 1978, introduced the bill. It was initially brought forward as part of the larger Telecommunications Reform Act of 1994, but Congress adjourned that year before putting it to a vote.

During the next Senate session, alarmed by the apparent anti-free-speech provisions of Exon's amendment, Senator Patrick Leahy, a Vermont Democrat, issued his own amendment to the Telecommunications Reform Act, proposing that Exon's 1994 CDA provisions be tabled to give the U.S Justice Department 150 days to study the best ways to regulate pornographic material on the Internet. Exon reacted by issuing another amendment, this one striking all of Leahy's proposals and reinserting his 1994 CDA provisions. The debate in the Senate from that point focused on which of the amendments the Senate should pass. Eventually, they chose Exon's.

In Senate debate, Leahy questioned the constitutionality of the Exon bill. "I do not think under this amendment a computer user would be able to send a public or private e-mail with the so-called 'seven dirty words,'" he argued. "Who knows when a recipient would feel annoyed by seeing a four-letter word online?"

Exon responded by arguing that the U.S. did not have 150 days to wait for a government study while America's children became further defiled by online pornography, nearly half of which, Exon claimed, depicted the sexual torture of women. "If nothing is done now, the pornographers might be the primary beneficiary of the information revolution," he said.

Exon's fellow Senators agreed, and the CDA passed 84–16 on June 14, 1995. The U.S. House version, known as the Cox-Wyden bill, passed on August 14, 1995, without debate on the CDA issues. However, CDA provisions were resuscitated in the "Hyde amendment," a late change endorsed by Republican Senator Henry Hyde of Illinois. A version of the bill containing Hyde's amendments passed into law, signed by President Clinton on February 8, 1996.

In the 1997 book Sex, Laws and Cyberspace, authors Jonathan Wallace and Mark Mangan argue that the CDA, while "innocuous or even incomprehensible" on first blush, was actually "a radical attack" on free speech. First of all, the authors write, the U.S. Supreme Court had already ruled on the applicable issues in a 1957 case, which declared that First Amendment protections forbade a state from restricting adult free speech to a level acceptable to children. Further, the authors maintain, the CDA sought to restore long-discredited "indecency standards." They point to a 1971 case involving a protester convicted of wearing a jacket with a profanity scrawled on it. Justices overturned his conviction, saying that the government "has no right to cleanse public debate to the point where it is grammatically palatable to most squeamish among us."

The decency standard, however, has been applied to broadcast media. The Court upheld sanctions against a radio station that violated FCC rules by broadcasting a George Carlin comedy routine about "the seven dirty words you can't say on the air." The jokes were aired during a mid-afternoon show, at a time when children were likely to be listening. The same standard also was applied to 1-900 sex-chat phone lines, in a law that requires operators to take steps to ensure that minors are not exposed. This law was one of the justifications Exon used in introducing the CDA.

Had the CDA been enforced, violations would have carried a maximum possible penalty of two years in prison or $100,000 in fines. While aimed at pornography, the law also applied to speech. It explicitly forbade knowingly transmitting to minors "any comment, request, suggestion, proposal, image or other communication" that is "obscene or indecent." Further, the CDA made it illegal to use a computer to knowingly make available to children "any comment, request, suggestion, proposal, image, or other communication" that, "in terms patently offensive," describes or depicts "sexual or excretory activities or organs."

Opponents of the legislation, including the American Civil Liberties Union, the American Library Association, America Online, and the Critical Path AIDS Project, criticized the law as an unconstitutional attempt to regulate free speech online, and the courts agreed. On June 12, 1996, a three-judge federal panel in Philadelphia issued an injunction blocking enforcement of the law. They argued that, "As the most participatory form of mass speech yet developed, the Internet deserves the highest protection from government intrusion." The Internet's strength is chaos, the judges wrote, just as the strength of liberty depends on the "chaos and cacophony of the unfettered speech the First Amendment protects."

At the command of U.S. Attorney General Janet Reno, the U.S Justice Department appealed the ruling to the U.S. Supreme Court, which heard oral arguments in Reno v. ACLU on March 19, 1997. Three months later, in a landmark 7-2 decision, the Supreme Court affirmed the Philadelphia panel's ruling, declaring that the CDA violated free speech rights under the First Amendment of the U.S. Constitution.

In his majority opinion, Justice John Paul Stevens attacked the law for reaching too far in trying to protect minors. "The level of discourse reaching a mailbox simply cannot be limited to that which would be suitable for a sandbox," Stevens wrote. He also complained that the statute was too vague; in the first of its two parts, it attempts to limit access to "indecent" speech, and in the second part aims at communications that are "patently offensive," without defining either term. Lastly, he objected to the fact that, in the statute, there seemed to be no way to tag and identify "indecent" material without creating extreme burdens on online speech, which would almost certainly dam the free flow of speech and thought on the Internet.

Influential Stanford University law professor and author Lawrence Lessig denounced the CDA in his 1999 book Code and Other Laws of Cyberspace. "A law of extraordinary stupidity," Lessig wrote, "it practically impaled itself on the First Amendment."

Not satisfied with this defeat, Congress crafted and passed a similar law in 1998, the Child Online Protection Act (COPA), which opponents call CDA II because of its CDA-like provisions. COPA abandons the concept of indecency, and instead seeks to control online material that is "harmful to minors." The courts thus far have not been impressed. A federal judge issued an injunction barring enforcement of that law in early 1999, and in June 2000 the Third Circuit Court of Appeals struck down the law as unconstitutional.

Bibliography

Congressional Record. Remarks of Senator James Exon. June 9, 1995, <http://www.epic.org/cda/exon_remarks.html> (April 5, 2002).

Featherly, Kevin. "Judges Back Free Speech Online." June 12, 1996, <http://www.channel4000.com/news/stories/news-960612-115755.html> (April 5, 2002).

Lessig, Lawrence. Code and Other Laws of Cyberspace. New York, N.Y.: Basic Books, 1999.

U.S. Supreme Court. "Reno v. ACLU Decision." June 26, 1997, <http://www2.epic.org/cda/cda_decision.html> (April 5, 2002).

Wallace, Jonathan and Mark Mangan. Sex, Laws and Cyberspace. New York, N.Y.: Henry Holt and Co., 1997.

Further Reading

Broder, John M. "Clinton Readies New Approach on Smut." New York Times, June 27, 1997.

Dyson, Esther. Release 2.0: A Design for Living in the Digital Age. New York, N.Y.: Broadway Books, 1997.

Lanier, Jaron. "Unmuzzling the Internet." The New York Times, January 2, 1996, p. A15.

Leahy, Sen. Patrick. "A Bill to Amend the Communications Act of 1934 to Repeal the Amendments Relating to Obscene and Harassing Use of Telecommunications Facilities Made by the Communications Decency Act of 1995." Republished at <http://www.epic.org/CDA/repeal.html> (April 5, 2002).

Tapscott, Don. Growing Up Digital. New York, N.Y.: McGraw-Hill, 1998.

U.S. Supreme Court. "Reno v. ACLU - Transcript of Supreme Court Oral Argument." March 19, 1997, <http://www.aclu.org/issues/cyber/trial/sctran.html> (April 5, 2002).

Related Topics

Child Online Protection Act & Child Online Privacy Protection Act; Content Filtering; Electronic Communications Privacy Act; Electronic Frontier Foundation; Internet Service Providers; Lessig, Lawrence; Obscenity

—Kevin Featherly

Cyberfeminism

Cyberfeminism is a term coined in 1994 by Sadie Plant, Director of the Cybernetic Culture Research Unit at the University of Warwick in the U.K., to describe the work of feminists interested in theorizing, critiquing, and exploiting the Internet, cyberspace, and new-media technologies in general. The term and movement grew out of "third-wave" feminism, the contemporary feminist movement that follows the "second-wave" feminism of the 1970s, which focused on equal rights for women, and which itself followed the "first-wave" feminism of the early 20th century, which concentrated on women's suffrage. Cyberfeminism has tended to include mostly younger, technologically savvy women, and those from Western, white, middle-class backgrounds. The ranks of cyberfeminists are growing, however, and along with this increase is a growing divergence of ideas about what constitutes cyberfeminist thought and action.

Prior to the advent of cyberfeminism, feminist study of technology tended to examine technological developments as socially and culturally constructed. One major argument was that technology has been positioned as part of masculine culture — something that men are interested in, good at, and therefore engage in more than women. Even though women throughout history have been active in developing new technologies, feminists have argued that technology has still been looked upon as a masculine creation. For example, although women had been involved in the creation and development of the computer, their contributions were largely marginalized, and their participation often ignored or written out of history. Therefore, feminists such as Judy Wacjman, a professor of sociology at the Australian National University in Canberra, and Cynthia Cockburn, an independent scholar and activist in London, argued that technology needed to be continually interrogated and re-conceptualized, and that women needed to become more active in technological areas as well.

Also pointing the way for cyberfeminism was the work of Donna Haraway, a professor in the History of

Consciousness program at the University of California at Santa Cruz. In her groundbreaking essay "A Manifesto for Cyborgs," she argues for a socialist, feminist cyborg that challenges the singular identities and "grids of control" that work to contain women and other marginalized groups. Haraway agreed that women needed to become more technologically proficient, better able to engage with the "informatics of domination" and challenge these systems. But Haraway also and importantly argued that women would need to be savvy and politically aware users of these technological systems; simply using them was not enough.

From these beginnings, cyberfeminism began to develop. Plant, an important early proponent, has argued that women are naturally suited to using the Internet, because women and the Internet are similar in nature — both, according to Plant, are non-linear, self-replicating systems concerned with making connections. She has argued that although previous feminists have believed computers to be essentially male, we should instead see computers and the Internet as places for women to engage in new forms of work and play — where women are freed from traditional constraints, and are able to experiment with identity and gain new avenues for claiming power and authority. Her view of cyberspace is as a welcoming, familiar space for women, where they can and must seize opportunities to advance themselves and to challenge male authority.

Some younger feminists active on the Internet, while they do not identify with theoretical arguments about masculinity or the similarities between women and computers, also see the Internet as a vital space for women to "claim their territory," and use the technology to gain power and authority in contemporary society. Some women in this group would reject the label "feminist" altogether, but would still see the Internet as a vital tool or space for women to learn about and engage with. To advance these ends, individuals and groups have created Web sites, discussion groups, and other online resources for women interested in learning more about Internet technologies, and also for women already employed in information technology areas. These groups believe that empowerment for women can be achieved through women's greater knowledge of new-media technologies, and through the creation of more opportunities to advance in these lines of work.

Another branch of cyberfeminism argues that the idea of women gaining power and authority merely through greater use of new-media technologies is overly simplistic or reductive. Australian feminist scholars, such as Susan Luckman of the University of Queensland and Anna Munster of the University of Fine Arts, believe that this approach reduces complex technological systems into mere tools and ignores their historical contexts of production and use. They believe that technologies are embedded in structures of power, which are not always positive. In their opinion, calls for women and girls to uncritically take up and advance the use of these new technologies does nothing to critically assess technology's larger role in culture, and how we wish to see it technology develop — or not. Women must be part of this future, not by simply advocating for more women to engage in using technology, but by becoming more critically aware of the perils as well as promises that new technologies offer.

Other critiques of earlier cyberfeminist work suggest that the call for more women to engage with new technologies is based on mistaken assumptions about real living conditions. Simply put, all women do not have access to computers and the Internet, and likely will not in the foreseeable future; cyberfeminists who make the simple declaration that "all girls need modems" are ignoring the conditions of those who do not share their privileged middle-class, Western (and often white) background. Women's material conditions must be taken into account when considering how best to advance feminist ideas, online or otherwise.

Beyond the root idea that gender equity, particularly in new-media technologies, is a desired goal, cyberfeminism itself, a growing area of thought and study, is not a unified set of ideas concerning women and new technologies. Cyberfeminists explore many areas of theory: that women are naturally suited to using the Internet, as both share important commonalities; that women can best empower themselves by becoming fluent in online communication and acquiring technological expertise; and that women would do best to study how power and knowledge are constructed in technological systems, and how and where feminists can disrupt and change these practices for the betterment of all members of society.

Bibliography

Haraway, Donna. "A Manifesto for Cyborgs." In Simians, Cyborgs and Women: The Reinvention of Nature. New York: Routledge, 1991.

Luckman, Susan. "(En) gendering the digital body: Feminism and the Internet." Hecate, 25 (2) 1999, 36-48.

Munster, Anna. "Is there postlife after postfeminism? Tropes of technics and life in cyberfeminism." Australian Feminist Studies, 14 (29) April 1999, 119-131.

Plant, Sadie. "Babes in the net." New Statesman & Society, 27 January 1997, 28.

Spender, Dale. Nattering on the net: Women, power and cyberspace. North Melbourne, Victoria: Spinifex Press, 1995.

Further Reading

Haraway, Donna. Modest-Witness@Second-Millennium.FemaleMan-Meets-OncoMouse: feminism and technoscience. New York: Routledge, 1997.

Millar, Melanie Stewart. Cracking the Gender Code: Who Rules the Wired World? Toronto, Second Story Press, 1998.

Plant, Sadie. Zeros and Ones: Digital Women and the New
    Technoculture. UK: Fourth Estate, 1997.

Related Topics

Cyborg; Gender and New Media; Harraway, Donna; Laurel,
Brenda; World Wide Web

—*Mia Consalvo*

Disposal of Computers

Computing is often thought of as a "clean" industry, but
the disposal of computers has become a significant envi-
ronmental and economic problem.

Obsolescence remains the primary reason for com-
puter disposal. Rapid increases in processor speed and
continual changes in computer architecture have result-
ed in an ever-increasing rate of computer obsolescence.
The Environmental Protection Agency projects that by
2005, for every new computer manufactured, another
one will become outdated.

In the U.S. alone, more than twenty-four million
computers became obsolete in 1999. Of those, only four
million were properly recycled or donated; the remain-
ing twenty million were dumped into landfills, inciner-
ated, shipped as waste exports (and probably dumped or
incinerated upon arriving at their destination), or stored.
Because users are often unaware of options for disposal,
computers are usually placed in storage once they are
deemed obsolete. While a computer's condition is gener-
ally known before it is put in storage, those that have
been stored for some time have to be tested before they
can be put to any sort of use. A company would pay a
technician to do such testing; this expense adds to the
financial liability of computer recycling.

When thrown into landfills or incinerated, comput-
ers and computer monitors can release hazardous mate-
rials and heavy metals into the environment, such as
lead, mercury, and hexavalent chromium. Each of these
substances poses unique dangers to human beings . The
assorted plastics in computers contain brominated flame
retardants, which can act as endocrine disruptors. Lead,
which is used to protect computer users from radiation,
can have negative affects on the nervous system, the
endocrine system, the liver, the blood, and the kidneys.
Mercury can cause brain damage, and hexavalent
chromium can cause DNA damage in human cells.

In landfills, these substances will eventually leak
into the drinking water supply and enter the human
food chain. Incineration releases toxic chemicals into the
air, where they can be breathed in; it also creates ash and
slag containing toxic substances, which require special-
ized disposal. Additionally, some pollutants released
through computer disposal, such as lead, do not disap-
pear over time. As a result, many places have declared
computers, or at least computer monitors, to be haz-

ardous waste. This means that they require special
means of disposal, and cannot be dumped into landfills
or processed with other garbage.

Most states have some way to deal with obsolete
electronics. The Electronic Industries Alliance (EIA)—a
group that promotes electronics manufacturing—has
links to information about disposal on their Web site
(http://www.eiae.org). Several industry and environmen-
tal groups are working together to test various models of
computer recycling, such as municipal collection, fund-
ing retailers to collect old machines, and providing con-
sumer drop-off sites. The U.S. Department of Education
and several non-governmental organizations have also
been working to get used but functional computers into
public schools.

The disposal of computers has become an issue
worldwide. In Canada, Toronto and other cities have
established public disposal depots for recycling comput-
ers. Elsewhere, governments are exploring the idea of
Extended Product Responsibility (EPR). Germany, the
Netherlands, Norway, Switzerland, and Denmark have
all enacted EPR-related laws, and other European coun-
tries are following suit. In EPR, producers are held
responsible for the physical management of their prod-
ucts, for the costs of the waste created by their products,
and for informing consumers about the possible envi-
ronmental effects of a product at different times in its
life cycle. They are also liable for environmental damage
caused by their products. Some companies are beginning
to implement EPR measures on their own, but it is not
yet a pervasive practice in computer manufacturing.

The environmental cost of computer disposal is a
major challenge facing manufacturers and consumers.
While environmentally safe disposal efforts are underway,
computer manufacturers are beginning to explore build-
ing computers that are safer to throw away. Fujitsu, for
instance, already advertises a more "environmentally
friendly" computer, though it remains to be seen whether
significant changes can be made in the materials used to
manufacture computers and monitors. In the meantime, if
you have a computer to dispose of, you can find resources
for computer reuse or recycling on the World Wide Web.

Bibliography

"Disposal of Computers Goes Slowly." Taipei Times Online
    Edition, May 24, 2001. http://www.taipeitimes.com/news/
    2001/05/24/story/0000087159>(April 5, 2002).
"Manufacture and Disposal of Computers an Environmental
    Nightmare." Earth Crash Earth Spirit (eces.org),
    November 23, 2000. <http://www.eces.org/articles/stat-
    ic/97495920099756.shtml> (April 5, 2002).
Goldberg, Carey. 1998 (12 March). "Where Do Computers
    Go When They Die?"
U.S. Environmental Protection Agency. 2001. "Life Cycle of
    Old Computers." http://www.epa.gov/Region2/r3/prob-
    lem.htm (April 5, 2002).

Further Reading

Computer Professionals for Social Responsibility. "Position Paper on the European Union Directive on Waste Electrical and Electronic Equipment (WEEE)."2001. <http://www.cpsr.org/program/environment/WEEEPosition Paper.html> (April 5, 2002).

Related Topics

Education and Computers; Digital Divide; Universal Design

—Jonathan Sterne

Freenet

Freenet is an application for sharing computer files of all kinds (music, text, video, and so on) over the Internet while protecting the confidentiality of the data source and its recipient. The goal is to develop the potential of computer networks to render any centralized regulation or censorship of information unfeasible. This goal, explicitly stated by Freenet's creator Ian Clarke, is a controversial one that has triggered an ongoing discussion of ethical and legal issues surrounding copyright protection online.

According to The Economist magazine, Clarke dreamed up Freenet because he feared that the Internet could become an instrument of such authoritarian control as to make dystopian author George Orwell appear unimaginative. Clarke wanted an information system to exist that not only had no centralized administration, but also provided complete anonymity to each user on its network, whether they were creators or users of information. His University of Edinburgh paper, "A Distributed Decentralized Information Storage and Retrieval System," outlined Clarke's vision in 1999; shortly thereafter, Clarke and a team of volunteers began building the system.

While Clarke helped to force the issue of online censorship and copyright protection, he also aspired to build a community of users who would continue to develop and expand the application. In keeping with this hope, Freenet's source code is open to the public, so users can continue to develop and improve the application. During the project's early months, Clarke estimated that more than 100,000 copies of the application were downloaded, but it is part of the nature of the project that it is impossible to determine the exact number of users.

Freenet makes regulation difficult by relying on a decentralized computer network that allows computer files to be distributed so that users don't know which files are being stored on their computers. Rather than sharing information in a top-down, server-to-client model, wherein files are centrally stored and distributed to individual users, Freenet relies on a peer-to-peer model, in which information is passed from computer to computer on the network until it reaches its destination. When a file, such as a music track, is entered into one computer in the network (called a node), it is encrypted and copied onto several other nodes with which the computer is in contact. Each node keeps track of the files that it is storing, and of the files stored on a few other nodes. Thus, each node of the network can "see" only a fraction of the information available, and there is no centralized record of the location of all the available data.

To retrieve a file from the network, a user needs to determine the name, or key, with which the data was entered by learning it from another user or from an online index. The request to retrieve the file is passed along the network from node to node, until it encounters a node that "knows" where the file is. Once the file is located, it is handed back along the same path, leaving a trail of copies. The duplication process has a dual function: It increases the availability of frequently requested files, and it makes it more difficult to trace the file's source. In addition, this process ensures that any attempt to trace a file in order to eliminate it results only in its further duplication.

Offered as a truly decentralized form of file sharing, Freenet remains more complicated and cumbersome to use than more centralized applications like Napster, the application for sharing music files online that gained notoriety in 2000 when it was sued by the Recording Industry Association of America. There is no easy way to search a network or even the names of available files, and until Freenet programmers develop such a system, users must rely on Web sites with partial and often out-of-date key indexes.

The limitations of Freenet in its current form inhibit its potential to render copyright protection and censorship obsolete. However, Clarke's vision raises the issue of the desirability—or, as some might argue, the inevitability—of pursuing such a course. Clarke argues that since copyright allows "middlemen" to monopolize control of the creative process, the system should be replaced by one in which audiences provide voluntary contributions to content creators or invest in them.

As for objectionable content, Clarke argues that the importance of unregulated speech in a democratic society outweighs the regulatory interest in protecting users from banned content. "I really think this is an extremely moral position," he said. "It might be black and white. It might be a very uncompromising position. But I think it needs to be, because if you create the means to censor information, even if your intentions are initially good, you will also have created the machine to censor information that probably deserves not to be censored." The willingness of users to share this version of free-speech absolutism by transforming their computers into conduits for information that could include anything from child porn to alternative news may help decide the viability of Clarke's vision.

Bibliography

Cohen, Adam. "The Infoanarchist." 26 June 2000. Time, pp. 46-47.

The Economist. "Here, There and Everywhere." 22 June 2000.
http://www.economist.com/displayStory.cfm?Story_ID=814 36. (22 March 2002).

Featherly, Kevin. "Freenet: Will It Smash Copyright Law?" 20 March 2001.
<http://www.newsbytes.com/news/01/163395.html> (22 March 2002).

— —- —-. Telephone Interview with Ian Clarke. 19 March 2001.

The Free Network Project: Rewiring the Internet. "FAQ." 10 May 2001.
<http://freenetproject.org/cgi-bin/twiki/view/Main/FAQ> (22 March 2002).

Further Reading

Kleiner, Kurt. "Free Speech, Liberty, Pornography." Reed Business Information New Scientist, 10 March 2001, p. 32.

Koman, Richard. "Free Radical: Ian Clarke has Big Plans for the Internet." O'Reilly Open P2P.com, 14 November 2000.
<http://www.openp2p.com/pub/a/p2p/2000/11/14/ian.html > (22 March 2002).

Oram, Andy, ed. Peer-to-Peer: Harnessing the Power of Disruptive Technologies. Beijing, Cambridge: O'Reilly, 2001.

Related Topics

Digital Millennium Copyright Act; Distributed Networking; Encryption; File sharing; Napster; Open Source Movement; Peer-to-peer Networking

—Mark Andrejevic and Kevin Featherly