Digital amnesia ; Bubble era gone, dot-com players buckle down for a second shot at success.

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ABSTRACT (ABSTRACT)

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FULL TEXT

When a part for a nuclear reactor begins to deteriorate, the first course of action is to find out how to replace it. But what happens when the digital record containing key information about that part mysteriously vanishes?

That was the problem Ontario Hydro faced in the early 1990s, when a digital record for a worn-out reactor sealing-ring was nowhere to be found. After a frantic search, an even larger problem was uncovered. The utility discovered that many digital-only documents created and stored in a new computer network were being managed in a haphazard fashion by under-trained staff.

Suddenly, paper wasn't looking so pass.

"An auditor once said to me that the scary thing is not that digital records are out of control, the scary thing is we don't know how out of control they are," says Terry Cook, visiting professor for archival studies at the University of Manitoba.

Cook, formerly the senior archival manager at the National Archives of Canada, first wrote about Ontario Hydro's digital dilemma in 1995 for the Technology Review, published by the Massachusetts Institute of Technology.

He warned then, as he does today, that the erosion of institutional memory in a digitally documented world is a real, and increasingly urgent, threat.

"It's like corporate or national amnesia. You can't remember what you did. You can't remember what worked well. If you don't know where you've been, you can't know where you're going," says Cook.

For a society that thrives on speed and convenience, the temptation to embrace all things digital is difficult to resist. The ability to store documents, files, pictures, music and movies in a digital format can save government and industry significant amounts of physical space and create enormous efficiencies. It also brings unparalleled public and private access to information that might otherwise be quarantined to dust-covered filing cabinets.

The world produces more than one billion gigabytes or one exabyte of unique digital content each year, with printed documents representing a measly 0.003 per cent of total information storage, according to a report from the School of Information Management and Systems at the University of California, Berkeley. Put another way, the digital information we produce annually equates to more than 100,000 pages of text for every man, woman and child on the planet.

As more of our business and legal documents, medical images, government and health-care records, intellectual property and libraries materials are born or converted to digital, attention must turn to their proper management and preservation. Without the ability to control the authenticity and assure the long-term access and integrity of these records, chunks of our history could end up as digital dust.

"There are situations that are completely scary," says Luciana Duranti, chair of the archival studies program at the University of British Columbia and head of a worldwide project, called InterPARES, to study the long-term preservation of electronic records.

Duranti points to a number of examples where digital-only records have been lost forever. In East Germany, a large number of electronically stored administrative records from labour statistics to penal registration lists vanished because of poor records- management policy. Likewise, satellite photos that document the defoliation of the Brazilian rainforest and a significant amount of data from the 1976 Viking exploration of Mars are no longer accessible.

Often this data is lost because of obsolescence: the hardware or software used to access or read the records is no longer available and current technologies are not compatible. This is the case with the Mars data, which were stored on tapes that can no longer be read.

A classic example is the 1960 U.S. Census Bureau. Information from that was stored on digital tapes that only one machine, now kept under lock and key in the Smithsonian Institution, is able to access.

Today, we save music as MP3, WMA, WAV or Quicktime files and we play them on media players made by Microsoft, RealNetworks and Apple. We save documents as Adobe PDF, Microsoft Word, Corel WordPerfect and Web-ready HTML files, often incompatible with the respective software programs that created them.

Can we be sure that 20, 50 or 100 years from now that all the digital content created by these technologies will be accessible and available for posterity? As the cycle between innovation and obsolescence shortens, it is becoming an increasingly urgent question.

Earlier this month, Sony Corp. announced that it would produce its final run of Betamax video recorders before discontinuing the product line forever. The VHS format, which beat out Betamax as the standard at the time, is now threatened by the DVD itself under target by newer, more advanced video-playback and storage technologies.

Remember the video laserdisc? The eight-track player? The 5-1/4- inch floppy? MS-DOS? Case closed. Last week, news reports drew attention to the huge amounts of "digital memories" of Sept. 11 that were created and are now displayed on the World Wide Web. Will they be around on Sept. 11 a hundred years from now?

Ditto for all the digital records being created by the entertainment and media industries, universities, the broader business community and our various levels of government touching everything from digital ultrasound images to original recordings from Cheryl Crow to electronic purchase orders at a nuclear facility or a public institution. It could be something as simple as an e- mail message.

"Universities are using electronic means to speed the processing of day-to-day work," says Garron Wells, head archivist at the University of Toronto, where she is responsible for developing institution-wide archives and records management programs.

"How do we preserve that information so that down the road the university itself has access to student records as permanent records?"

Wells, who has held similar posts at the Hudson's Bay Co., Bank of Nova Scotia and with the Ontario government, suggests that the root of the problem is with the companies that create the software and hardware that feed the digital revolution.

"The designer of systems aren't looking long term, they want to sell the software right now to meet the immediate demands of organizations," she says.

The challenge, says Prof. Duranti, is to create guidelines and standards that governments, industry and makers of technology can use today to assure the preservation of electronic records those already generated as well as the exabytes of digital content to be created in the future. That's why the InterPARES project is so important.

InterPARES, an off-shoot of a research project led by Duranti at the University of British Columbia, stands for "among peers" in Latin, but it's also short for International Research on Permanent Authentic Records in Electronic Systems. In 1997, Duranti invited scholars, archival institutions and representatives of the private sector to participate in the InterPARES project, which was officially launched two years later with a team of 190 researchers and the participation of more than 20 countries, as far off as Beijing and Pretoria.

The first phase of InterPARES, now complete, focused on how to preserve and assure the authenticity of electronic documents that have already been created. Duranti, an Italian who moved to Canada 15 years ago, says the standards resulting from this phase are currently being incorporated into laws and policies around the globe.

The second phase, which will be complete in 2006, aims to be proactive, by putting guidelines in place for the future creation of digital records. The idea is that these guidelines, over time, will become routine tasks that can be easily verified, making the appraisal process more legitimate.

"We have dynamic records that are dependent on data in databases and spreadsheets, we have interactive systems in which each user causes a response by the system. These systems used to be rare, but now

governments are using them for transaction with citizens," says Duranti.

"Canada says it's going completely digital in its interactions with citizens by 2004. There are no policies in place and standards for doing it in a way where these interactions through a Web site, for example, can be kept intact and preserved over time."

In July, Industry Canada, through the Social Sciences and Humanities Research Council of Canada, granted $2.5 million to the second phase of InterPARES, making Canada the second-largest investor in the project next to the United States. Total funds are expected to exceed about $23 million by the time the project is complete.

The project has attracted the attention of NASA, the medical and pharmaceutical community, DreamWorks studio, and a number of other industries outside the public sector.

"The public sector is concerned about accountability, while the private sector is concerned about money," says Duranti. "We have lots of issue with copyright and intellectual property rights here."

She emphasizes the distinction between converting paper-based documents or analog materials to a digital format, and creating and storing original content through digital means. The former is typically done to make distribution of materials more efficient, such as scanning original documents and making digital copies accessible on the Web.

A good example of this is The Toronto Star's "Pages of the Past" online archive, which provides searchable access to more than 100 years of the newspaper's pages, all scanned from originals that have been protected over time. Similar attempts to "digitize" history are being done by governments, universities and media organizations throughout the world.

But what happens when the original is created digitally? What's the essence and context of the record? How do we prevent it from being tampered with and guarantee that the original is in fact the original?

"You have to identify for each record what it is you can't afford to lose and what it is you have to prove has not changed," says Duranti. "It's useless to preserve a material if you can't rely on it as the (original) source."

It's also useless if the machines that read this content become obsolete. Herein lies the importance of creating standards-based software and putting policy in place that assures the periodic "migration" of records to newer digital formats that can run on modern hardware.

This, however, has its own problems, says Wells at the U of T. "People archive material electronically, they save it offline, they stick in on a shelf and then they forget to go back to it to make sure it has been migrated or refreshed," she says. "If they don't build in the resources to continually do that, then we're sunk."

And migration itself doesn't assure the integrity of the document. Just as some forms of digital storage, such as compact discs, can begin to degrade after 30 years, migration of records to new storage mediums can cause further degradation. After 20 migrations to a new standard, the record could become completely incomprehensible over, say, 50 years particularly when the content is multimedia and interactive, meaning it can be dependent on links with other documents, images and databases.

Cook, at the University of Manitoba, says with all the digital clutter out there, one of our best strategies may be to

save only those records deemed worthy of long-term preservation, perhaps even as "reflections" or summaries of the originals.

He remains optimistic that a solution to the problem will be found.

"There are some reassuring precedents in history," says Cook. "It took about 150 years for the printing press to really come into its own. The first printed books had no page numbers, meaning no indexes were possible. I think we're going through a similar transformation now."

Prof. Duranti knows she has an enormous task ahead of her, but she says the more the issue is studied, the faster the problem of digital preservation can be tackled.

"Because of the urgency of the situation, we can't wait anymore," she says. "It's very challenging, very important and pressing. But I love doing it." E-records are getting lost and a big effort is under way to save them for posterity

Illustration

Caption: JEFF VINNICK FOR THE TORONTO STAR E-ARCHIVIST: University of B.C. professor Luciana Duranti, superimposed on a laptop screen in the university archives in Vancouver, leads an international project to safeguard digital documents.

Credit: Toronto Star

DETAILS

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