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EDITORIAL

Investing in Digital Knowledge

Last month I attended two conferences, "Digital Knowledge" in Toronto and "Electronic Visual Arts" (EVA) in Florence, which led me to think more deeply about what kinds of digital objects those of us concerned with cultural heritage information should be creating. At both meetings, most people were discussing ways to capture and provide access to digitized libraries of texts and images which were essentially the kinds of information products that exist in analog libraries, but at each there was at least a glimmer of realization that this was not the right thing to be doing. By the end of the week I was fully convinced that we have been trying to make the wrong digital knowledge and that we need to radically redirect our efforts.

At the "Digital Knowledge" conference, the falsifying note was struck by the founders of the Internet Public Library who insisted that what people wanted was services not digitized resources. At EVA, the death knell to "compile images and texts" or "author multimedia products" was sounded by those who were engineering solutions rather than hand crafting them. Perhaps I can explain.

Digital conversion of printed books and photographs produces fast paper; it has some advantages in terms of storage and delivery over the original, but it fundamentally fails to use digital multimedia technologies to advantage. A photograph of a windmill is nice; a photograph that allows us to peel back the cover, see the mechanisms, run the mill and watch the way the crank is attached to power distribution systems, examine the renovation history and the ownership of the mill over time, etc., uses interactive multimedia to advantage. The first point to make about digital knowledge then is that it is functional, it should do something or be a service. If it is not, then it is digitized information from analog sources, and it won't excite or really do what we need.

The second issue is how to deliver objects embodying digital knowledge. What we have been doing is compiling them or authoring special "titles" which present them in a narrative or a web for navigation. Both authoring and compiling are approaches to using hand-made objects and don't scale up. What is needed is approaches to engineered delivery of multimedia objects. Engineered delivery involves architecture and design in place of compilation and authoring.

At the EVA conference, several authors presented approaches to algorithmically making links between objects, or driving presentation from databases and the results of queries to databases. It was clear that when digital objects were authored, or hand-crafted, they were unique, but when designed they were parts of a whole with coherence between each unit. When compiled, objects had standardized content imposed by librarians, but when architected they had standardized structures to support specific functions as imposed by engineers. The difference in the two approaches was re-usability, support for multiple independent intellectual perspectives, and the ease of reconfiguration. All this added up to greater value over time.

Cultural heritage institutions, when they construct digital knowledge, must make objects that are inherently interesting as multimedia, last over time, and carry value that only the legitimacy and interpretive scholarship of the repository could have created. Instead much attention is being paid to making huge libraries of cultural clip art. As David Wallace argues in his review of museum sites on the World Wide Web in this issue, those institutions which use the Internet to show a few images, or a few thousand, without much documentation are essentially shouting into a noisy ballroom. In a few years there will be hundreds of thousands or millions of images on the net; they won't constitute digital knowledge. Only deep documentation, structured for re-use and made accessible to engineered search and navigation approaches, will be able to qualify for the rubric of knowledge.

And even these should be intrinsically interesting objects, with layers of meaning that require multimedia support to explain themselves.

ARTICLE

HTML makes a great delivery vehicle for Web-based information. It just isn't a sensible place for much of that information to live in.

by Richard Light

This article is a follow-up to a comment I made on one of the CIDOC discussion lists. I suggested that many of the HTML "pages" out there on the World Wide Web would not pass close inspection by an SGML parser (i.e., a program that checks for valid SGML), even though in principle HTML is a perfectly valid application of the SGML standard. I went on to suggest that the value of these pages would be increased by making sure that they were actually SGML-conformant. This would allow them to be re-used for other purposes, by any SGML-aware software. "Fair point," said our worthy Editor, "tell us more". So I tried. So what is SGML (and indeed HTML)?

But before I tell you what happened when I tried, I had better expand my acronyms. CIDOC you will probably know of the Documentation Committee of the International Council of Museums. If you don't know what the World Wide Web is, you are to be congratulated on the quality of the lead-lined box you live in. So that leaves just two HTML and SGML.

HTML is short for HyperText Markup Language, and it is the tagging scheme you use when creating World Wide Web ("Web" henceforth) pages. You put these tags around bits of text to indicate what they are, and thus determine how they look (more or less) when viewed by a browser such as Netscape or Mosaic. Here is a bit of a typical Web page, complete with tags:


```
<HTML>

<HEAD>

<TITLE>CIDOC Welcome Page</TITLE>

<BASE HREF="http://www.icom.org/CIDOC/default.html">

</HEAD>

<BODY>

<H2>CIDOC - The International Documentation Committee</H2>

<P>

Welcome to CIDOC's site on the World Wide Web.
```

<TITLE> is a "start-tag," indicating where the title begins. </TITLE> is the corresponding end-tag. The text between them is therefore the "TITLE element." <HEAD> indicates the start of the "HEAD" information. You will see from the position of the </HEAD> end-tag that it contains, not text, but two other elements (TITLE and BASE). All HTML elements are nested inside each other in this way: the whole page is nested inside the "HTML" element. Note also that <BASE> has extra stuff inside the tag

```
(HREF="http://www.icom.org/CIDOC/default.html")
```

and lacks an end-tag.

OK, so that's the HTML scheme: so what is SGML? The answer is that it is the same: I have actually been describing SGML tagging rules! The only difference is that HTML gives you a (fairly) fixed set of tags to play with, whereas SGML lets you define your own. SGML stands for Standard Generalized Markup Language. It is an International Standard (ISO 8879:1986) for marking up electronic texts in a way which reflects their underlying structure and content. The idea is that this markup is independent of any particular rendition of the text: the same SGML text could be displayed in a number of ways. SGML texts contain, or make reference to, a Document Type Definition ("DTD") which

defines the tag structures that they are allowed to contain. HTML is a set of closely related DTDs (V2.0, V3.0, Netscape 1.1, etc.) defining the tags that can be used for Web pages. Thus HTML is an application of SGML, or to be precise it is a family of similar applications. If you want to know more about HTML or SGML, the Web has a number of sites. One starting point is SoftQuad's home page (http://www.sq.com) which makes reference to both HTML and SGML resources.

Back to the plot . . .

The article you're not going to get

As background for the article I thought I was going to write, I went to CIDOC's home page on the Web (http://www.icom.org/CIDOC/) and browsed around, looking for pages that would exhibit fascinating examples of non- conformance to the SGML standard (!) I downloaded a selection of pages and fed them to an SGML parser. There were a few anomalies, to be sure, but I am glad to say that the standard of CIDOC's work in this area is, as ever, very good. Many of the error messages were due to using the "wrong" version of the HTML DTD (the CIDOC home page from which the above extract was taken was unusual in quoting the version of the HTML DTD it used: most of the time I had to guess). One was caused by a design error in the DTD itself (allowing "%" in a numbers-only attribute, if you're interested). All in all, there wasn't much to set pulses racing.

But then I wondered if this was really the right point to start. Wouldn't a better question be "why use HTML at all, when you have the option of SGML?" So that's the topic I'll address, and I hope it will be more enlightening than a discussion of SGML parsing errors. Of course, if it was obvious that HTML was entirely the wrong approach for everyone setting up Web pages, we would all be using SGML for this purpose. And very few people are. So why might this argument have particular weight for museum information?

Museum information - a long-term resource

The HTML family of DTDs is in a continuous state of flux. V2.0 is widely used and supported. However, V3.0 offers a variety of useful

additional features. Developers at Netscape are busy creating their own variant which will offer facilities to differentiate their product from other browsers. There is no guarantee that any version of the HTML DTD is "future proof." This is fine for browser vendors, but where does it leave the creators of Web pages? The CIDOC guidelines on creating Web pages recommend using V2.0, which is the current baseline supported by most browsers.

Most of the information on the Web is fairly transient. Many home pages (museum ones included) are essentially there to promote the company or organization concerned. It is expected that a well-run Web site will be actively maintained, which involves editing or replacing pages on a regular basis. In the course of this updating work, changes to the HTML DTD ("new features") can be accommodated fairly painlessly. Museums tend to hold information that is of long-term value (such as "public access" collections information), and expect to use it over a reasonable period of time. They want to be able to create Web pages which will still be valid in five years' time. (I could have said "fifty," but that is futile: will the Web itself still be around by then? Probably so, but "not as we know it [Jim].")

Of course, there is a reasonable chance that a set of 50,000 object record pages, marked up and hyperlinked according to the safe but features-deprived V2.0 DTD, will still be readable by browsers in five years. But it is no more than a "reasonable chance," and the outcome is not under the museum's control. And if HTML V5.0 turns out not to be backwards-compatible, someone is faced with the task of updating those 50,000 pages.

There is a (much) better way. If the HTML that the user receives is generated on the fly, the updating problem goes away. This can be achieved in a number of ways, but two are of particular relevance to museums. One is to hold the information to be browsed as a database, and to run searches on it, converting the "hits" to HTML as they are passed back. The other is to hold the information as SGML, and do much the same thing. Now, if a new version of HTML comes along, all that is needed is a change to the script that generates the HTML tags. This approach even offers the possibility of simultaneously supporting several "flavors" of HTML from the same set of data. (Thinking further ahead, there might be a vogue for delivering other formats, such as PostScript, on the Web this technique would take that in its stride.) Thus there is no reason not to use the latest features of HTML if they will show off your information to better advantage.

The database approach is very appropriate for collections information, since it will already (in most cases) be held in one. All that is needed is Web access to the database, and a script that converts the output to HTML. Several databases are now offering this possibility. The SGML option is more appropriate for "full text" resources such as publications. At present, SGML databases supporting this approach are thin on the ground and expensive, but they do exist.

Museum information - a rich resource

Since most of the information on the Web is generated *ab initio*, the limitations of the HTML DTD are not a problem. This DTD is good at the jobs it was designed for, i.e., displaying Web pages and supporting hyperlinks and multimedia. However, much of the textual information that museums hold has rather more to it than that.

I have been involved in helping the CIMI Consortium design an application that will allow exhibition catalogs, exhibit wall texts, and object information to be searched and viewed on the Web. Our analysis of the texts showed a wealth of potential "access points" for retrieval in the text: people, events, objects, etc. If we were forced to use HTML to mark up these documents, they would not be able to support the retrieval which these access points can give. The only option that made sense was to design a "museum" DTD which allows all relevant information to be marked up.

Once the relevant part of an SGML exhibition catalog has been retrieved, it can be converted to HTML as discussed above, or viewed directly as SGML. There is now a free Web browser for SGML documents (Panorama, downloadable from SoftQuad's Web site) which we have used successfully to view exhibition catalogs as part of CIMI's Project CHIO. Returning the SGML allows the user to see the full richness of the source document; for many purposes the HTML rendition will be perfectly adequate. Our choice or the user's.

Museum information - a reusable resource

One general argument for using SGML is that it allows documents to be re-purposed. They can be delivered as printed books, CD-ROMs, Web pages, etc. Elements from a number of sources can be combined into a new "publication." These arguments certainly apply to museums, which will (should!) routinely want to make the best use of the scholarship that has gone into each publication.

By and large, Web pages are not re-usable. The tagging is specifically geared to page layout, and the hyperlinks are specific to the URL scheme used (only) on the Web. The SGML documents we have marked up for Project CHIO could, by contrast, easily be used in other publication media. As well as using the museum-specific tag set mentioned above, we have taken care to remove all Web-specific hyperlink addresses from the documents themselves, and have placed them in separate lookup files. By replacing these lookup files (which currently map to URLs) we could easily publish these exhibition catalogs on (say) a CD-ROM which used a different naming convention for hyperlinks. The documents themselves could be used as they stand.

Museum information - an outsize resource

The approach used in HTML assumes that Web pages will be relatively small in size, and that users will browse from "frame" to "frame." While there is no absolute limit on the size of Web pages, this design imposes a relatively "flat" structure on the information. Once again, this is fine so long as you are creating Web pages from scratch. However, if you have an existing resource such as an exhibition catalog to mark up, HTML would force you either to break it up into many pages, or to flatten its structure (and create a humungous page!). Either way, you would not be able to represent the true structure of the source document.

If a full text source is marked up as SGML, it is possible to dynamically create "views" of that source (such as a virtual table of contents, or a specific chapter that the user has selected) and deliver them on the fly as HTML. This way, the integrity of the source document is maintained, and flexibility of user access is not compromised.

HTML - don't shoot the messenger

As I mentioned above, HTML does the job it is designed for very well. It just doesn't do all jobs for all people. Museums (and other providers of long-term, large-scale, richly structured information) would do well to consider the use of databases and/or SGML to hold their key information, delivering HTML that is generated on the fly in response to user requests. CIMI's Project CHIO is already demonstrating that museum catalogs can be browsed on the Web as SGML. It plans to go on to provide an integrated database combining full-text SGML sources, object database records, images, bibliographic records and authorities, with search results converted to a consistent [HTML] format on the fly. Watch this space!

Museums on the World Wide Web: A Survey and Analysis of Sixteen Institutions

David A. Wallace (davidw@lis.pitt.edu)

INTRODUCTION

This article reviews sixteen museum sites on the World Wide Web (WWW) representing four institutional types: art museums, cultural history museums, natural history museums, and science museums. These sites were evaluated along several broad dimensions: collections, visitor interaction, visitor data, and information provided for museum professionals (see Figure One). As with the previous review of archival institutions on the WWW[1], the sites selected were all "true" (http) WWW sites, not just a Gopher site available through the WWW.

The sixteen sites evaluated are:

Art Museums

* Dallas Museum of Art
  http://www.unt.edu/dfw/dma/www/dma.htm
* Metropolitan Museum of Art
  http://www.metmuseum.org/
* Minneapolis Institute of Arts
  http://www.mtn.org:80/MIA/
* Whitney Museum of American Art
  http://www.echonyc.com/~whitney/

1 *Archives and Museum Informatics: Cultural Heritage Informatics Quarterly*, Vol 9 #2, 1995; p. 150-175.

Cultural History Museums

* Canadian Museum of Civilization
  http://www.cmcc.muse.digital.ca/cmcchome.html
* Kelsey Museum
  http://classics.lsa.umich.edu/Kelsey/Outreach.html
* Mariner's Museum
  http://www.mariner.org/mariner/
* U.S. Holocaust Memorial Museum
  http://www.ushmm.org/

Natural History Museums

* Field Museum of Natural History
  http://www.bvis.uic.edu/museum
* Natural History Museum, UK
  http://www.nhm.ac.uk/
* Royal Tyrrell Museum of Palaeontology
  http://www.tyrrell.com
* Swedish Museum of Natural History
  http://www.nrm.se

Science Museums

* Franklin Institute Science Museum
  http://sln.fi.edu/
* Ontario Science Centre
  http://www.osc.on.ca/
* Oregon Museum of Science and Industry
  http://www.omsi.edu/
* Science Museum of London
  http://www.nmsi.ac.uk/Welcome.html

The focus is strictly on information content and not on the ergonomics of site WWW pages, such as the logic of their organization, the degree of their user friendliness or unfriendliness, or the coherency of their hypertext linkages and flows. The dimensions and subdimensions analyzed deal mostly with how museum content is presented to virtual visitors and what types of virtual visitor services and interactions are offered. How visitors interact with the site and whether

they can or cannot provide feedback to the institution was also considered. As with the previous survey, I felt that it was high time that a comparative home page content analysis was undertaken, and hoped that even a cursory analysis of sixteen representative institutions would uncover interesting patterns, or even, perhaps more interestingly, the absence of patterns.

Figure One lists the dimensions and subdimensions surveyed, the possible values each subdimension can possess, and their meaning. Figures Two, Three, Four, and Five present the results of the survey at each of the sixteen institutions examined. The text which follows these figures both analyzes these results and provides descriptive details of the more interesting attributes uncovered during detailed site navigations.

Figure One: Evaluative Criteria

DIMENSION	SUB-DIMENSION	VALUES	MEANING
Collections Information	Browsable Images	Y-Yes; N-No	Are actual objects from this institution's collections available for online viewing?
	Format	SI-Still image; MI-Moving image; S-Sound	In what format(s) are browsable objects available?
	Interpretive information/ documentation	A-All; M-Most; S-Some; N-None	How many browsable objects contain associated interpretive descriptions and/or other documentation?
	Exhibits	C-Current; P-Previous; F-Future; N-None	Are browsable objects associated with current, previous, and/or future exhibits available?
	Searchable catalog	Y-Yes; N-No	Is an interactive search interface to the museum's collections available?
Visitor Interaction	Online tours	Y-Yes; N-No	Are virtual "tours" of the actual museum available (via floorplans, galleries, special exhibits, etc.)?
	Arrange visits	Y-Yes; N-No	Can online visitors make arrangements to visit or tour the actual museum?
	Events calendar	Y-Yes; N-No	Is an events calendar available?
	Educational program(s)	Y-Yes; N-No	Is information on lectures, classes, and/or other educational program(s) offerings available?
	Membership	IO-Membership information only; MO-Enables users to become members online; N-None	What membership options are available?
	Volunteering	Y-Yes; N-No	Is information on volunteer opportunities available?
	Staff contact information	Y-Yes; N-No	Is a staff directory available?
	Museum Shop	IO-Information only; P-Online purchases N-None	What options are available through the museum shop?
	Links to external collections	Y-Yes; N-No	Are hypertext links to other museums and/or relevant subject or cultural heritage information provided?

DIMENSION	SUB-DIMENSION	VALUES	MEANING
Visitor Data	Statistics	Y-Yes; N-No	Are statistics on the use of this WWW site available?
	User feedback	Y-Yes; N-No	Are virtual visitors able submit online feedback?
For Other Museum Professionals	Professionally-oriented information	Y-Yes; N-No	Is information of specific interest to museum professionals available (e.g., annual reports, collecting policies, museum research projects, etc.)?

Figure Two: Art Museums

DMA-Dallas Museum of Art; **MMA**-Metropolitan Museum of Art; **MIA**-Minneapolis Institute of Arts; **WMAA**-Whitney Museum of American Art

DIMENSION	SUB-DIMENSION	DMA	MMA	MIA	WMAA
Collections Information	**Browsable Images**	Y	Y	Y	Y
	Format	SI	SI	SI	SI
	Interpretive information/ documentation	N	A	N	A
	Exhibits	N	C	C/F	C/P
	Searchable catalog	N	N	N	N
Visitor Interaction	Online tours	Y	Y	Y	N
	Arrange visits	N	Y	N	N
	Events calendar	Y	Y	Y	Y
	Educational program(s)	Y	Y	Y	Y
	Membership	IO	MO	IO	MO
	Volunteering	N	N	Y	N
	Staff contact information	N	N	N	N
	Museum Shop	N	P	IO	P
	Links to external collections	Y	N	Y	Y
Visitor Data	Statistics	N	N	N	N
	User feedback	Y	N	Y	Y
For Other Museum Professionals	Professionally-oriented information	Y	Y	N	Y

Figure Three: Cultural History Museums

CMC-Canadian Museum of Civilization; **KM**-Kelsey Museum; **MM**-Mariner's Museum; **HMM**-U.S. Holocaust Memorial Museum

DIMENSION	SUB-DIMENSION	CMC	KM	MM	HMM
Collections information	Browsable images	Y	Y	Y	Y
	Format	SI	SI	SI	SI/S
	Interpretive information/ documentation	S	S	S	A
	Exhibits	C/P	C/P	C	N
	Searchable catalog	N	N	N	Y
Visitor Interaction	Online tours	Y	Y	N	N
	Arrange visits	N	N	N	Y
	Events calendar	Y	N	Y	Y
	Educational program(s)	Y	N	Y	Y
	Membership	IO	N	MO	N
	Volunteering	Y	N	N	N

DIMENSION	SUB-DIMENSION	CMC	KM	MM	HMM
	Staff contact information	N	N	N	N
	Museum Shop	P	N	IO	N
	Links to external collections	Y	Y	N	N
Visitor Data	Statistics	N	N	N	N
	User feedback	Y	N	Y	N
For Other Museum Professionals	Professionally-oriented information	Y	N	N	N

Figure Four: Natural History Museums

FMNH-Field Museum of Natural History; **NHM**-Natural History Museum, UK; **RYMP**-Royal Tyrell Museum of Palaeontology; **SMNH**-Swedish Museum of Natural History

DIMENSION	SUB-DIMENSION	FMNH	NHM	RYMP	SMNH
Collections information	Browsable images	Y	Y	Y	Y
	Format	SI/MI/S	SI/MI	SI	SI
	Interpretive information/ documentation	S	S	S	M
	Exhibits	C	C	C	C/P
	Searchable catalog	N	N	N	N
Visitor Interaction	Online tours	Y	Y	Y	Y
	Arrange visits	N	N	N	N
	Events calendar	Y	N	Y	Y
	Educational program(s)	Y	Y	Y	Y
	Membership	N	IO	IO	N

DIMENSION	SUB-DIMENSION	FMNH	NHM	RYMP	SMNH
	Volunteering	N	N	Y	N
	Staff contact information	N	Y	N	Y
	Museum Shop	N	P	N	N
	Links to external collections	Y	Y	Y	Y
Visitor Data	Statistics	N	N	N	N
	User feedback	Y	Y	Y	N
For Other Museum Professionals	Professionally-oriented information	Y	Y	N	Y

Figure Five: Science Museums

FISM-Franklin Institute of Science Museum; **OSC**-Ontario Science Centre; **OMSI**-Oregon Museum of Science and Industry; **SML**-Science Museum of London

DIMENSION	SUB-DIMENSION	FISM	OSC	OMSI	SML
Collections information	Browsable images	Y	Y	Y	Y
	Format	SI/MI/S	SI	SI/MI	SI
	Interpretive information/ documentation	S	N	S	A
	Exhibits	C	C	C	C
	Searchable catalog	N	N	N	N
Visitor Interaction	Online tours	Y	Y	Y	Y
	Arrange visits	N	Y	N	Y
	Events calendar	N	Y	Y	Y
	Educational program(s)	N	Y	Y	Y

DIMENSION	SUB-DIMENSION	FISM	OSC	OMSI	SML
	Membership	IO	N	IO	N
	Volunteering	N	N	Y	N
	Staff contact information	N	N	Y	N
	Museum Shop	IO	N	IO	P
	Links to external collections	Y	Y	Y	Y
Visitor Data	Statistics	Y	Y	Y	Y
	User feedback	Y	Y	Y	Y
For Other Museum Professionals	Professionally-oriented information	N	Y	Y	Y

ANALYSIS

Two major issues that were not directly addressed by the survey were revealed: (1) intellectual property is a central concern for all museums and; (2) the purposes of WWW sites are quite different from one institution to the next.

Intellectual property has surfaced as one of the most challenging issues faced in the distributed digital environment, and, increasingly, museums which decide to offer digitized object representations are facing these concerns. As a consequence, formalized copyright statements have become a standard feature at many sites. For example, the Minneapolis Institute of Arts and the Whitney Museum of American Art provide almost identical copyright statements -obviously drawing off standardized biolerplate language of unknown origin. Notices that the contents of institutional WWW sites - both images and text -are the intellectual property of the museum and are not considered to be in the public domain, are becoming common. While allowances are made for educational and/or personal use - thereby establishing parameters of acceptable use -usage for commercial purposes or publication is strictly prohibited. The Dallas Museum of Art requests that online visitors follow their intellectual property guidelines, thereby helping to not only protect the integrity of the works offered, but also ensuring the continuance of their online public access project. This latter concern is real. At the request of the artist Robert Frank, the Whitney Museum of American Art does not include images from an exhibit of his works on its WWW pages. As discussed recently on the MUSEUM-L listserv, concerns over the downloadability and mutability of images on the WWW have led quite a few contemporary artists to follow the advice of legal counsel and are opting to not have images of their works reproduced on the WWW. Some institutions are pursuing technical strategies for managing copyright concerns, such as manipulating the quality of images. The Kelsey Museum informs online visitors to their "Ancient Nubia: Egypt's Rival in Africa" exhibit that the "quality of...images has been intentionally compromised to discourage their unauthorized use." What is clearly evident from the above is that no institution or online visitor can afford to ignore copyright issues. For institutions this means developing strategies for offering (and, unfortunately, not offering) images over computerized networks. For users this means respecting copyright and understanding when their actions fall within acceptable use and when they do not.

Another important issue emerging from the extremely rapid rate of growth of museum's creating WWW sites for the public is the question, "What is the purpose of these sites?" William H. Luess, President of the Metropolitan Museum of Art, believes that his institution's WWW site will "encourage more people to visit the Museum itself." And while virtual visits will not replace "the experience of viewing art in the galleries....this Web site is designed to motivate and inform visitors so that they can make the best use of their time when they come to view the works of this vast institution." Several of the Natural History and Science museums surveyed have taken the opposite approach and have quite consciously attempted to deliver virtual visitors learning experiences where a visit to the actual museum is neither overtly encouraged nor necessary to reap true benefits. For example, the Franklin Institute Science Museum's "The Heart: A Virtual Exploration" exhibit enables online visitors to view a video clip of an open heart surgery; examine a heart x-ray; and peruse historical images of medical science. Also available are numerous hypertext links for self-guided

exploration. One section of the exhibit's text includes the following (hypertext links in bold and underline):

> "Explore the heart. Discover the complexities of its **development** and **structure**. Follow the **blood** through the blood **vessels**. Wander through the weblike **body systems**. Learn to have a **healthy heart** and how to **monitor** your heart's health. Look back at the **history** of heart science."

The Field Museum of Natural History provides interactive online games based on the content available at its WWW site. These games test knowledge of extinction and survival, as well as species anatomy. These online "quizzes" present the user with a series of questions and multiple choice answer options. The online functionality allows the user to select an answer and receive feedback on their choice.

Evidently, different types of museums are promoting different functionalities and visions of where their WWW site fits in their mission and what experiences will be available to virtual visitors. What follows is a detailed analysis of what sixteen museums' WWW sites offered in January, 1996.

COLLECTIONS

Browsable Images

Not suprisingly, all sixteen institutions had browsable images online. What would be the purpose of a museum creating a WWW presence if they provided no browsable online images from their collections? What is suprising, however, is the variability in both the number of objects offered and their presentation.

The copyright situation may be the reason many institutions have opted to provide a very limited selection of object offerings for online browsing. Alternatively, museums may be taking a purposefully cautious approach to creating a WWW site and trying to learn how best to provide widespread public access to large amounts of digitized holdings. Or, it may be that the cost of large scale digitization is beyond what is possible in their existing budget.

The Whitney offers only three viewable objects from its "Permanent Collections" link, the Canadian Museum of Civilization provides only one item per collection area (of which there are only a handful), and the U.S. Holocaust Memorial Museum provides only one digitized item -the text and audio of "Piesn Obozowa," a song written in April 1945 at a concentration camp and performed by the author in 1960. The Mariner's Museum and the Natural History Museum, UK, also provide a limited number of representations. The latter museum does, however, provide access to an exhibit on fossils which exists solely in virtual reality. Using Virtual Reality Modeling Language (VRML), fossils are viewable in three dimensions and can be rotated "as if it were a real object" and be reduced or enlarged to different scales. The Royal Tyrrell Museum of Palaeontology, instead of providing images of individual objects, had decided to deliver panoramic images of the interior of the museum and special exhibit panels, directly replicating the view witnessed by visitors to the actual museum itself. Unfortunately, this presentation does not work very well when viewed from a computer screen.

A few of the museums in our sample choose to provide a far greater diversity of images. The Dallas Museum of Art, Metropolitan Museum of Art, Minneapolis Institute of Arts, and the Science Museum of London are among those institutions which have made dozens of digitized objects available over their WWW sites.

Format

Still image representations were available at all sixteen of the surveyed sites. However, only three sites provided sound, and only four museums provided moving images. Interestingly, these four were clustered in the natural history and science museums categories. The only two instances where all three possible formats (still image, moving image, and sound) were available, and two of the three instances where two formats were identified, were at natural history and science institutions.

The Field Museum's "Teeth, Tusks and Tarpits" section of its "Life Over Time" exhibit on evolutionary processes and their examination includes movies, sounds, and games. Available are MPEG moving image animations of assorted dinosaurs, a sabertooth cat, and a running

camel, and virtual visitors can listen to an audio clip of something described as "mammoth bone music."

The Franklin Institute Science Museum's exhibit "Ben Franklin: Glimpses of the Man" provides the virtual visitor with:

* "Things to See" - Such as images of Franklin, pictures of the Franklin family home, his tombstone, etc.
* "Things to Do" - Virtual visitor interpretations of Ben's sayings. "Enrichment Activities" for grades 4-8, such as reading the Articles of the Constitution and looking for Franklin's influence; evaluating the epitaph Franklin wrote for himself as a young man and comparing it to the one he finally received, then writing your own.
* "Things to Hear" - Listen to selections from Poor Richard's Almanack and then contribute your own thoughts on specific ones and see what others have written. Listen to sound clips on what Franklin thought about science, music, the economy, statesmanship, invention, printing, and other topics.
* "Things to Learn" - A list of resources on Franklin, a timeline of his life, his family tree, and a glossary of terms from the exhibit.
* "Places to Go" - Hotlinked resources on Franklin available on the Internet.

Interpretive Information/Documentation

I was quite surprised by the lack of documentation I encountered, especially in light of the concerns over intellectual property and the potential benefit derived from understanding as much about an object as possible - in terms of both provenance and interpretation.

Eleven out of the sixteen sites examined (roughly 70%), had either no documentation attached to any images or provided only some of the available images with documentation. Thankfully, almost 30% of the sites provided documentation for all or most of their exhibited objects.

Although the Dallas Museum of Art provided documentation, this documentation was often found to be weak. For example, while the viewer of a work may learn who created it and its title (such as Edward Hopper's "Lighthouse") they could not find out the date it was made, its

medium, nor its actual size. In contrast, the Metropolitan Museum of Art provides a rich array of documentation for available online images. An online visitor who selects and enters a gallery or section of the museum, "Art of Africa, Oceania, and the Americas" for example, is provided information on the size of that section's holdings and its strengths. Within each section a small number of digital representations of objects (usually from one to three) are shown. Selecting any one of these provides access to the image and a 100-200 word description of the work itself, including factual data such as its title, date, original provenance, medium/material, size, and ownership, as well as interpretive data which provides the viewer with a description of its aesthetics and meaning. Rich documentation was also encountered at the Science Museum of London which provides item level descriptions in its "History of Flight" online exhibit. Documentation associated with airplane images in the exhibit include a synopsis of the craft; its importance; inventory number; and technical details such as span, length, maximum speed, power plant, and armament.

A different approach to documentation was witnessed at the Field Museum, where documentation is embedded in the text associated with a virtual walk through rather than with the objects themselves. Here, the emphasis seems to be more overtly pedagogical than object centered. This is also reflected by the hypertext link to a "Teachers Guide" which includes "previsit and postvisit activities that add to the positive learning experience of a trip to the Field Museum."

Providing richer documentation for exhibited objects is clearly one area where museum WWW sites could improve. There is no reason that such documentation cannot be easily made available, and it would not only provide for an enhanced educational experience, but also contribute to clarifying the authenticity of the object.

Exhibits

The vast majority of sites surveyed -fourteen out of sixteen - provided online access to some information about current exhibits. Far fewer, however, provided the same access to past (four institutions) or future (only one) exhibits. The following is a sampling of what was encountered at these fourteen sites:

The Metropolitan Museum of Art provides access to a section entitled "Special Exhibitions," which includes a brief description of each and, usually, one image from current exhibitions. The Minneapolis Institute of Arts presents virtual visitors with a link to current and future "Special Exhibitions." However, much like the Metropolitan, it provides a brief description and a single image. The Whitney's WWW page includes access to a past exhibit, "Edward Hopper and the American Imagination," wilth multiple images from the exhibit, as well as a lengthy text which contains information on Hopper, the exhibit, and the curators. The Whitney's future and traveling exhibits, though listed, provide no associated images for the virtual visitor.

The Canadian Museum of Civilization presents the online visitor with information about past, present and future exhibits (through 1999!) While no images are provided for planned future exhibits, images are available for both current and past special exhibits. The past exhibit, "Homage to Nature: Landscape Kimonos by Itchiku Kubota" provides a nice sample of images and text about the exhibit and the artist. Documentation on specific pieces, however, is absent. The Canadian Museum of Civilization's past exhibits illlustrate a potentially exemplary use of WWW technology which can provide permanent homes to exhibits which physically existed in a designated locality at a particular point in time. How often do we miss viewing an exhibit we would have liked to experience?

The Canadian Museum of Civilization's museum's current exhibit "Imperial Austria: Treasures of Art, Arms and Armor from the State of Styria" provides the option to view images from the exhibit using an online slide show. Unfortunately, these slides loaded much too quickly when I visited. Consecutive slides were launched the instant the previous slide had completed loading, thus preventing the viewer from seeing individual images. Alternatively, one can view a ten category script of the exhibit, each with useful documentation and several associated images.

The Kelsey Museum includes nearly 20 images from two galleries - Greek and Roman, and Egyptian and Near Eastern. Although no documentation is provided for any of these images, objects which are not currently on display at the physical museum itself are included.

Future plans for the Kelsey's online offerings promises "longer descriptions of each object, maps showing the origin of each object, comparative objects, and references to further readings about each piece."

The Swedish Museum of Natural History provides access to two virtual exhibits - one current and one previous. These are the "Starry Messenger and the Polar Star: Scientific Relations Between Italy and Sweden from 1500-1800" and the "Mammoth Saga." The Mammoth Saga, which ran at the museum for five months in 1994, contains separate pages for items such as flora, fauna, ecosystem, sabertooth cats, and the like. Each item contains a useful hot link to further reading drawing upon extra-local resources available on the WWW. For example the "Mammoth" link provides links to online mammoth information available at the Royal British Columbia Museum.

The Oregon Science Centre's "Life Science Hall" provides a "ChickCam" link which displays a continuously updated still image from their chick hatchery. Otherwise, though, visitors are presented with photographic images of the museum/exhibit space rather than images dedicated to individual objects. The Centre's "Computer Playground" online exhibit presents users generic links, such as an Introduction to the WWW, Cool Science Links, and Hot Sites. In addition, visitors may create an actual WWW page which will be temporarily hosted by the institution and visit the temporary pages of other visitors who have decided to build one. Also available are video clips from their "February Storm in Wilamette County" which contains both MPEG and quicktime clips taken just the day before I visited.

Finally, the Science Museum of London provides two online exhibits - "Treasures of the Science Museum: A selection of objects that helped shape the modern world," and "The History of Flight." This latter exhibit provides access to over 200 pages of information and seventy images on the history of flight. The virtual visitor can control their navigation through this exhibit by entering from a variety of points, including: Aircraft on Display; Aero Engines on Display; A History of Flight; People; Gallery Floor Plan; and Views of the Gallery.

Despite the fact that exhibits are almost universally available at museum WWW sites, the depth of their content vary widely. Some offer extremely limited text and images while others provide nearly the entire content of individual exhibits. The former provide minimal informational content while the latter provide truly useful spaces for user exploration, demonstrating the potential of the online environment as an arena for rich learning experiences and increasing the relevance of geographically distant museums to teachers and learners both in and out of formal educational environments. Interestingly, some institutions have even generated special exhibits which exist solely in virtual form and which have no physical counterpart.

Searchable Catalog

Only one of the sixteen museums evaluated provide virtual visitors with an interactive search interface to its collections - the U.S. Holocaust Memorial Museum. Ironically, this institution was among those surveyed which provided the fewest digitized holdings to browse. Users here are able to question a database of the institution's archival holdings. The "USHMM Information Access System" allows visitors to enter queries in natural language format and in response, presents them with ranked retrievals. Users can opt to dig deeper by further refining and distilling their query to get at what they truly want. Unfortunately, the museum does not provide images of actual documents. Instead, retrievals are presented in the form of catalog records (thus providing a useful service to researchers conducting previsit explorations). Users can click on hypertext links built into individual retrieved catalog records to "initiate searches which make use of the formal cataloging done by the archivists," thus taking advantage of the use of controlled language for retrieval purposes. Catalog records themselves are fairly comprehensive, containing fields for call number, box location, summary, date, first language, provenance, amount (size), terms of use, citation, finding aids, creator, corporate names, topical subject.

Although they did not meet the criteria enumerated by this study - namely, provision of an interactive search interface to the museum's collections - several other surveyed institutions were found to provide online visitors with search and retrieval capabilities for their online services. For example, the Royal Tyrrell Museum of Palaeontology, the Franklin Institute Science Museum, and the Science Museum of London all provide search engines to their WWW sites, enabling visitors to easily identify and view items of interest on their WWW pages. The Franklin Intitute also allows virtual visitors to use a Lycos search and retrieval interface. A search of the term "printing" retrieved content summaries of 15 different relevant parts of this institution's site. Each retrieved "record" provides hypertext links to the relevant items, as well as their title, size, an excerpt, and the like. The Science Museum of London provides an interactive index and search interface to all the 350-plus Science Museum web pages. In this latter instance one can see, as these sites grow in volume and complexity, how search and retrieval assistance will limit user frustration and minimize the amount of happenstance navigation. As with documentation, museum WWW sites could be making better use of search and retrieval interfaces.

VISITOR INTERACTION

Online Tours

Online tours indicate the value of WWW sites to the host institution. Are visitors provided with logical layouts of objects, galleries, and exhibits mimicking the exploration one might encounter at the physical museum? Or are visitors presented with limited preset options that run in a defined sequence, offering little in the way of user navigation?

Interactive, hotlinked, floor plans or graphical interfaces were encountered at a number of the sites surveyed, including the Metropolitan Museum of Art, Minneapolis Insitute of Arts, Canadian Museum of Civilization, Royal Tyrrell Museum of Palaeontology, Swedish Museum of Natural History, Ontario Science Centre, and the Oregon Museum of Science and Industry.

The Royal Tyrrell Museum of Palaeontology provided, by far, the most extensive interactive floorplan of the sixteen sites evaluated. While the images were frequently photo interiors of the physical museum itself rather than individual objects, over sixty individual "sites" within the museum can be visited. Virtual tourists are presented with repeating hypertext icons for moving to the next location, moving to the previous location, or taking a side trip "for more detailed or related information on the current exhibit."

The Swedish Museum of Natural History's permanent "Polar Exhibition" provides an interactive floor plan containing 20 separate hot links to the exhibit within two separate floors at the museum. As with the Royal Tyrrell, available images appear to be photographs of dioramas at the museum - often represented by a stuffed animal - such as a polar bear or a sooty albatross - situated in a "natural" setting, rather than individualized objects with associated documentation. The Ontario Science Centre also repeated this format of presenting internal shots of a particular section of the museum.

In contrast, institutions such as the Metropolitan Museum of Art and the Canadian Museum of Civilization's hypertext floorplans provide access to specific galleries and rooms where the images are not of the physical museum space itself, but rather of particular objects. Unfortunately, in both cases the number of representations are currently quite few. For example, the Canadian Museum of Civilization provides summary data and a single object representation per area.

Although the Mariner's Museum provides an extensive listing and description of the museum's collections, galleries, and exhibitions, so few images of objects are actually provided that in no sense is an "online" tour of the museum possible. What is provided is akin to a description one might find in a brochure or tourist guide which informs the potential visitor why this museum might be worth visiting.

Finally, while the Natural History Museum, UK does not provide an interactive floorplan, it does provide an intuitive interface for online visitors. For example, selecting the "Exhibitions in the Life Galleries" option in the Museum link calls up 15 separate thumbnail images associated with specific areas, such as Marine Invertebrates, Dinosaurs, Mammals, Our Place in Evolution, Minerals, Plant Power, etc. Again, very few museum objects and almost no documentation are represented within the individual galleries I sampled (1/3 of those available). What one finds instead are slim descriptions of the subject content of these galleries.

Interactive floorplans, for the most part, seem to be oriented towards providing the user with a digital analogy to the physical museum space itself and are not oriented in themselves towards enabling a rich learning

environment. As admirable and intuitive as these interactive floorplans are, they were found to be thin on content and object representations. Far richer interactions were found in online special exhibits such as those described earlier at the Franklin Institute Science Museum.

Arrange Visits

Only 25% (or four out of the sixteen) institutions evaluated enabled online users to make arrangements to visit or tour the actual physical museum.

Warranting special mention here is the functionality exhibited by the Science Museum of London. This institution provides an online booking form for educational groups wishing to gain free admission to the museum. The online form acts on information provided by the potential visitor regarding:

* "Your School" - including the date of application, visit organizer, e-mail address, date of visit, alternate date, number of students, number of adults, age range of students, time of arrival and departure, name of head teacher, name of school/organization, comments, telephone number, fax number.
* "Your Group" - including information on organization type, number of students in a series of alternative classifications (including English as a second language, gifted, wheelchair users, degree of learning difficulty, language delay, complex needs - such as autism, visual impairment, hearing impairment, etc.)
* "Your Visit" - requests information on preferences for particular galleries to visit.

The U.S. Holocaust Memorial Museum provides an "On-line Group Reservation Request Form" for groups of 10 or more. Aside from basic contact information from the requester, this form allows the requester to denote the prefered date and time of the visit, alternate and second alternate date and time, number of adults and children in the group, and any other comments one may wish to offer. Confirmation packets are sent through regular mail. The online request form does not make an actual appointment, rather, it provides an opportunity to request trip information ahead of time. In other words, even though one can provide

data for preliminary arrangements, a complete reservation transaction cannot be conducted online at this time.

Given the convenience of collecting data online, thus saving time for all involved, it was suprising to find that more institutions are not offering this type of functionality.

Events Calendar

A vast majority of the insitutions evaluated do provide some type of online access to events, but there is wide variability in what is offered.

The Minneapolis Institute of Arts provides precise information and descriptions on upcoming lectures, film and video screenings, tours, and its "Family Days" programs, whereas the Whitney provides piecemeal offerings. Virtual visitors to this latter institution are not given a strong sense of what events are happening at the physical museum. Certain sections at the Canadian Museum of Civilization are out of date, such as listings for lectures, festivals, films, and live performances. Likewise, at the Field Museum, their special events ran only through December 1995 when I visitied this site at the end of January 1996.

It would seem that the online WWW environment provides an ideal opportunity for an institution to communicate timely information about events. However, this information ought to be as comprehenisive, deep, current and useful as possible.

Educational Program(s)

The overwhelmingly majority of museums provide at least some information on their institution's educational programs. Again, there is wide diversity amongst museums in terms of what they offer.

Given the pedagogical mission of the U.S. Holocaust Memorial Museum and the sensitivity of its subject matter, it is not surprising to find that a guide to teaching about the Holocaust is available online, as are a brief history of the Holocaust, frequently asked questions about the Holocaust, an article on children and the Holocaust, and a videography of Holocaust materials. Also available is information on a writing and

art contest for middle and high school students answering the question: "Imagine that you are living in the United States in 1936. Do you think that American athletes should participate in the Olympic Games in Berlin?"

At the Dallas Museum of Art, while it boasts that its Education Resource Center is "one of the most completely integrated education systems of any museum in the U.S.," online visitors are given little opportunity to find out specifically what is available, except that the brief description provided is tantalizing and may draw online visitors to the Center if they visit the physical museum. According to the description online, the "GTE Collections Information Center Project" allows visitors to the physical museum to sit at a computer terminal, query a collections database by artist/maker, title, and subject (including medium, period, style, etc.), and have thumbnail images returned with retrieved database records with documentation on the images themselves. Users can then choose to view larger images and even print them out on a laser jet printer.

The Minneapolis Institute of Arts provides a range of information on educational programs for patrons. Offerings include "Adult Classes and Seminars" and "Young People's Programs," including meeting dates, fees, and size limit. Descriptions for courses available in January and February 1996 include "Sketching in the Galleries - Impressionist Drawings and Paintings," "Conservation of Paintings: Materials Process, and Priorities," "African Staffs and Scepters," "Exploring Art," and "Watercolor Workshop: Along the Mississippi." This museum also provides access to the "Curriculum Materials" department, which "produces and circulates educational resources for teachers and community leaders..." who may not have access to the museum itself or can use it to complement a visit. This department also provides an online preview of its "World Mythology in Art" slide set, summary information on six interactive touchscreen programs at the museum, and a description of "ArtSmart," a program offered to high school students to learn about art and the functions of an art museum.

The Natural History Museum, UK, provides useful summary information on workshops, special events, tours, activity sheets, illustrated talks, classes, field study tours, and educational opportunities

sponsored by the museum. Target audiences include children, students, teachers, adults, and families.

The Royal Tyrrell Museum provides information on its unique educational programs such as a summer day camp, overnight trips, day trips, and hands on work - such as a two-hour guided tour to a dinosaur quarry to see an excavation in progress, or an opportunity to work alongside museum staff preparing fossils for study and display.

The Ontario Science Centre provides an extensive listing of school programs and workshops. Information on time, duration, frequency, group size limit, price, age appropriateness, and language are given for a wide range of museum programs, including: DNA Fingerprinting; Electricity and Magnetism; Fun with Chemistry; Human Performance; Holography and Light Theory; Rain Forest; Theory of Chaos; Whales; Your Body; etc.

The Oregon Museum of Science and Industry also provides rich information on its educational programs, including a hypertext menu bar listing which includes: Young Scholars Program; Science Classes - pre-K to 8th Grade; Teacher Education Programs; Boy's and Girl's Science Club; Traveling Programs; and Camp-Ins and Overnighters.

Some museums, instead of simply offering information about their educational programs, are actually delivering educational programs through their WWW sites.

The Field Museum provides a "sample of activities from the museum's Education Activities for the Life Over Time Exhibit, a package created for teachers and students." Included online are three activities which teachers are encouraged to print out and try out with their students: Words From the Past, How Big Was that Animal?, and Prehistoric Motion. The last provides JPEG images of a downloadable and printable flipbook showing two prehistoric animals (Albertosaurus and Triceratops) in motion, a downloadable crossword puzzle, and an exercize for conducting a size evaluation of dinosaurs.

The Franklin Institute Science Museum's WWW pages provide a "Units of Study" section which is "designed to stimulate critical thinking about the topic by both you and your students." It encourages "production and collaboration as the inevitable result of inquiry." The one unit available is "Wind: Our Fierce Friend." Using this unit, six teachers across the U.S. are "participating in an experimental project to investigate how telecomputing can support inquiry-based hands-on learning in their classrooms." Each school is investigating local wind patterns and then sharing their data with the online community. This encourages the creation and sharing of content within a museum-based project. (Also available is information on Science Programs available at the museum -such as "Teachers Overnight" which provides an overnight for teachers only. By morning, teachers "have explored the exhibits, participated in thematic workshops, and maybe made some new discoveries about science education.")

The Science Museum of London has instituted a series of online events "investigating the Internet..." called Science Museum Internet Learning Experiment (SMILE). Projects available include a short story competition, an e-mail conference, and a "consensus conference" on the WWW. Here, the museum wishes "to explore the educational potential of the Internet as a real-time, interactive communication system between remote users all over the world....The Internet is an open-ended, learner-driven medium. We look forward to learning with everyone else."

Educational programs turned out to be one of the most exciting areas of activity, not only in terms of seeing what museums are offering within their insitutions, but also uncovering how some innovative institutions are actually employing their WWW site to deliver educational benefits to virtual visitors. It can only be hoped that other museums will chose to deploy their staff expertise and collection richness to develop and launch similarly invigorating educational experiences for virtual visitors.

Membership

Ten out of the sixteen sites provided online visitors with either information about membership (seven sites) or the opportunity to initiate memberships online (three art and cultural history museum sites).

The Metropolitan provides an extensive array of information on the benefits associated with the many forms of membership available. It also allows online visitors to complete memberships transactions online, but I was unable to gain access to the link for encrypted transactions to pursue this thread further.

The Mariner's Museum provides an online membership form that allows one to select the level of membership and conduct the transaction using their credit card if they so desire. The online form asks for the credit card type, number, cardholder's name and expiration date.

The Dallas Museum of Art accepts membership inquiries online, but does not accept and process memberships online due to problems associated with conducting secure credit card transactions online.

And at the Whitney, although it also cannot currently accommodate secure credit card transactions, virtual visitors can fill out an online membership application form, which can also be used to give gift memberships, and have the museum phone them during the next business day to conduct the credit card transaction. Direct online transactions are to become a normal feature at this institution in the near future.

In a twist on online membership opportunities, the Canadian Museum of Civilization is developing an alternative revenue stream by soliciting virtual visitors to participate in their "Sponsor a Treasure" program. This program invites online users to participate in an "online auction of sponsorship opportunities." This is an effort by the museum to stave off the trend within the museum world to sell off certain holdings in order to keep the larger institution fully operational. Under this program users are requested to sponsor a work so that collections can be maintained and remain within the public domain. Sponsors will be publicly recognized for their efforts. This program is also being promoted as a means to help finance the placement of more museum objects online. Ironically, far more museum objects are exhibited in the auction catalog than in the permanent collections section of this site's pages. I viewed about one-third of the items up for auction and did not find a single one that had been bid on. The fact that the "Reserve Price" ranged from roughly $200-$1,000 maybe explains the absence of bids. A far cheaper

sponsorship where sponsorship is shared as opposed to being exclusively granted may be a more realistic strategy.

The challenges of "electronic commerce" as an application area within the distributed network environment appears to have justifiably made several institutions hesitant in offering fully functional online memberships. However, these challenges are being overcome and it will not be long before secure transactions over the WWW will not only be widely possible and trusted but be capable of providing new revenue streams for museums. As a minimum, however, all online museums should offer complete membership information and provide visitors the opportunity to fill out forms which can then be followed up by more traditional means for secure transactions.

Volunteering

Suprisingly, only four (25%) of the sixteen sites evaluated contained any information on volunteer opportunities, and none created provisions for engaging virtual visitors to commit themselves online as volunteers or engage in remote volunteer work.

The Minneapolis Institute of Arts provides summary information on volunteer internships available at the museum, noting that "[a]ll candidates with skills, interests, or experiences relevant to museum work are eligible for internships." And the Royal Tyrrell Museum provides information on becoming a volunteer for the museum's NOVA Discovery Centre, or as a lab technician, clerical assistant, education program, special events, public relations, or special skills (library, collections management, research, etc.) volunteer.

Since no kind of secure financial transaction is involved for volunteers, it struck me as odd that more museums are not utilizing this outreach communications medium as a gateway for soliciting volunteers. Very specific volunteer requirements can be posted for all sections within the museum desiring volunteers, leaving it up to virtual visitors desiring a volunteer opportunity to search through and isolate an opportunity to their liking. Also, museum's could probably draw upon the computer expertise of many WWW users and obtain volunteers to help improve their online presence.

Staff Contact Information

Formal staff directories were not common; only three of the sixteen sites were found to offer such information. More common was the presence of a hotlink staff e-mail address in context-specific areas of a museum's WWW pages, where clicking on the e-mail hotlink popped-up an e-mail message form with the recipient's address already filled in.

Some institutions such as the Minneapolis Institute of Arts and the Franklin Institute Science Museum provided access to telephone directories organized around institutional functions and entities - such as Library/Archives, Public Programs, Rights and Reproductions, Interactive Media Group, Marketing and Communications, etc. The Whitney provides a rather lengthy staff and position listing organized by function/department, as well as a staff history of who held which positions over the years. Unfortunately, no contact information is provided.

The Natural History Museum, UK, provides a gopher format staff directory, including a search interface to the directory. This institution also provides a link to the museum's press office, noting that the press can draw upon the expertise of the museum's 300-plus research scientists and collection managers. A listing of categories of expertise is provided, such as Botany, Entomology, Mineralogy, Biodiversity, Environmental Quality, Human Origins, etc.

In contrast to what has already been described, the Swedish Museum of Natural History provides a richly detailed and thorough organizational and staff directory. Listings from nine organizational entities as well as four divisions of research (zoology, botany, palaeontology, and geology) are provided. Hot link e-mail addresses are associated with many individuals, where clicking on an individual's hypertext e-mail address draws up an embedded e-mail form so you can compose a message to that person on the fly, with the addressing information already filled out for convenience.

The Oregon Museum of Science and Industry also provides an exhaustive staff directory. It can be accessed via keyword search interface, through an alphabetized listing, or even through a department listing. Individual staff listings also includes the hypertext e-mail addressing function.

While it may be desirable for the virtual visitor to have direct e-mail access to the institution's staff directory and their e-mail addresses, this may not be so highly valued by the museums themselves. Museum staff could start receiving tremendous amounts of unsolicited e-mail requesting all types of assistance. On the other hand, interactive directories may help place a human face on museum work and increase awareness of the types of expertise and degree of knowledge possessed by an institution's staff. It is perhaps not surprising that the three museums which have chosen to provide detailed interactive staff directories are within the Natural History and Science categories, as I have found that these types of museums oriented more to pedagogy in their online offerings than are art and cultural history museums. As a consequence, they are probably more likely and willing to offer online access to their staffs.

Museum Shop

Surely we would expect museums to be using the web sites for commerce. Slightly more than half of the museums surveyed (nine out of sixteen) offer any access to the shop. Four of these offer information only, and only five actually allow online purchases from their museum shops. Just as the online environment appears to make online membership options attractive to some institutions, the ability for remote visitors to scroll through an institution's shop and make online purchases has found resonance with some online museums. Museums oriented towards income production (such as the two art museums which do enable online membership transactions - the Metropolitan and the Whitney) also allow for online purchases from the museum shop.

When browsing the Metropolitan with Netscape, a transaction option asserts that "[a]ll communications between you and the Metropolitan Museum of Art Gift Shop will be encrypted so you can enter confidential information (like your address and credit card) in confidence." Online visitors can also choose to create a personal account with the Met's museum shop in order facilitate purchases. Unfortunately, I was not able to access the encryption option when I visited this site. The shop itself

has rather extensive offerings -jewelry, "distinctive gifts," stationary, posters and prints, scarves and ties, gift books and museum publications, and presents for children among its gift categories. The Whitney also allows virtual visitors to order museum store offerings, enabling them to click on the items they want and the quantity they desire. Sales tax is automatically added and users can select from among a number of shipping and handling options. By filling out the online order and contact information, users will be contacted by phone to complete the transaction with a credit card number.

The Canadian Museum of Civilization's "CyberBoutique" offers items for purchase along two distinct entry points -by categories such as Native, Canadiana, Museum Souvenirs, World Cultures, Just for Kids, and Military Memorabilia - or though a format classification which includes replicas and reproductions, posters and cards, CMC books, and multimedia. Virtual visitors can scroll through either of these groupings and automatically select items for purchase by having them slipped into a virtual "shopping bag." Once selections are made users are presented with an automated order form which calculates the price, including shipping (Federal Express) to any country destination. And a currency exchange rate link let's you determine the actual cost in local currency. As found with other virtual museum stores, users fill out contact information so that the payment transaction can occur outside of the electronic mail context through either fax, telephone, or regular old fashioned postage mail.

Although the Natural History Museum, UK and the Science Museum of London, do not provide direct access to their store per se, they do provide a rather detailed online catalog from Innovations On Line, which serves as an intermediary for purchases from these institutions. These catalogs are divided up into several discrete sections such as apparel, household, textiles, furniture, personal accessories, etc. As you peruse these catalogs you can select items which are automatically compiled onto a separate order form which also computes postage and packing. Online orders accept credit card numbers which will be encrypted for Netscape users. For those who do not yet feel comfortable transmitting their credit card over the Internet, other transaction options are available.

The Mariner's Museum shop, although it provides information only, furnishes a search interface to determine whether the museum shop carries a particular publication title. A search for the title "Victory at Sea" returned an title, author, item number, and price listing. A toll free number is also provided for direct ordering.

As with online membership transactions, some museums are still opting to stop just short of enabling users to enter their credit card numbers through secure encrypted interfaces. However, museum shops are clearly not as reticent when it comes to conducting online financial transactions. As electronic commerce becomes more integrated into the "business" of the WWW, we should expect to see more and more museums opting to provide a full retail service. It seems that any museum which is either already hosting or developing a WWW presence could take advantage of the potential inherent in reaching this new consumer base, offering visitors the ability to purchase the varied and unique items commonly held in museum shops.

Links to External Collections

Just over three-fourths (thirteen to be exact) of the sixteen sites surveyed provide some kind of access to WWW resources external to their particular institution. Some of these are compiled specifically by the host museum, while others draw off rich subject-oriented indexes compiled by other dedicated souls.

For example, the Dallas Museum of Art provides links to three large indexes compiled by other institutions which provide point and click access to hundreds of other museums on the WWW, while the Minneapolis Institute of Arts has developed several of its own links to external collections. It's "Online Arts Education Resources" is categorized into: "Real World" Museums; "Real World" University Museums/Galleries; "Virtual" Museums/ Galleries; and Art Education Resources.

The Whitney and the Ontario Science Centre have taken more eclectic approaches. The Whitney includes hotlinks to "Artists' Projects," and "Other Sites" (which includes institutional, poetry, commercial, political, and miscellaneous links) on the World Wide Web.

The Ontario Science Centre links include Local Links, Sister Cultural Agencies, Other Interesting Places, Finding Your Way through the Web, Beginners Guide to the WWW, and About Mosaic.

Not surprisingly, some institutions have developed linkages of direct relevance to the institution's subject matter and mission. For instance, the Natural History Museum, UK, provides extensive external links to materials in the earth and life sciences (including Museums and Botanical Gardens, Interactive Exhibits, Life Sciences, Earth Sciences, Natural History Societies, Geographic Information Systems, and Astronomy and Space), as well as to general information services and search tools. And the Royal Tyrrell Museum provides links to other palaeontological services on the WWW.

Still other museums have extended even further the scope of their external links. The Swedish Museum of Natural History provides links to a slew of useful Internet resources -navigational and search and retrieval interfaces, HTML tutorials - as well as to subject oriented links to life science, earth science, astronomy and space, entomology, phanerogamic botany, and vertebrate zoology. It also provides links to the Virtual Library Museum pages and the University of California at Berkeley's listing of natural history museums and the International Council of Museums (ICOM) home page. The Franklin Institute provides links to Internet resources for educators on over 25 separate topics, such as American History and Government, Black History, Insects, Museums, Online Exhibits, Space Science, Wind Energy, etc. The Online Exhibits link provides direct hypertext links to roughly 50 sites.

The richness and variety of external links offered by the museums was actually found to be quite impressive. Oddly, the three sites which did not offer external links were clustered in the art and cultural history museums categories where numerous exciting external links could have been made quite easily.

VISITOR DATA

Statistics

Only three of the sixteen sites evaluated provided public access to statistics on their usage, and all of these were science museums. The Franklin Institute and Ontario Science Centre provided simple server statistics, while the Oregon Museum of Science and Industry provided colored bar charts and a "rose graph" documenting numbers of accesses per month, by day of the week, and by time of the day. I am quite fond of such tools, however, it appears that many institutions do not find such information serves any useful purpose for online visitors. Hopefully, they collect and evaluate such data for their own operational purposes.

User Feedback

Three quarters of the sixteen sites evaluated (12 institutions) provided some form of feedback mechanism for online visitors. Feedback options ranged from the rather simple, where users submit their thoughts within embedded e-mail forms, to the elaborate, where they are asked to gauge their reactions along a series of detailed categories. It would be interesting in the future to assess how much of this feedback is used and how museums respond.

The Dallas Museum of Art, the Whitney, the Royal Tyrrell and the Ontario Science Museum all provided for users to enter their textual comments within either embedded e-mail forms or into more formalized "guestbooks." At the Whitney, users can choose to review the comments submitted by others who have passed before them. Of the 20 or so messages I reviewed, all were laudatory, even commenting that the virtual visit made them eager to visit the physical museum. And the Ontario Science Centre enables users to provide online feedback responding to its annual report.

More complex user feedback options were encountered at the Canadian Museum of Civilization, Mariner's Museum, The National History Museum, UK, the Field Museum, and the Oregon Museum of Science and Industry.

The Canadian Museum of Civilization asks online visitors to submit an e-mail message via a "Content and Performance Report" which gives them the opportunity to rate (Good, Medium, Poor) and comment on the WWW site's performance and its content. The Mariner's Museum provides a detailed site evaluation form which is used to not only receive comments but also enables the museum to collect detailed information about visitors submitting comments. Commentators are asked to submit their age, level of education, state/country of residence, income level, number of museums visited annually, and types of museums visited. Commentators can rank, from 1-10, the site's informational, entertainment, and interest value, as well as provide textual comments on what was best and least liked. Users are permitted the option of either submitting their comments anonymously or have them associated with themselves. Users can also opt to have further information about the museum sent directly to them by filling out an online address form and selecting from among 10 categories. The Natural History Museum, UK, provides hypertext links to individual staff members who were responsible for design, content and maintenance of the site. Clicking on an individual's name (which also provides a brief summary of the role they play) pulls up an e-mail message form. Also provided is an online "Feedback Form" which allows online visitors to let the museum know why the site was accessed; how it was discovered; what was best and least liked about it; how it rates in terms of its "design and ease of navigation;" how frequently the site has been visited; and additional text comments. The museum offers a lottery in which those who submit comments become eligible for a one year's free membership to the museum. The Field Museum provides an online form for the user to evaluate the online exhibits, asking information about such items as whether or not something new was learned; whether you would recommend it to another; whether you would visit again; age; gender; continent from; and room for a personal text message. Finally the Oregon Museum of Science and Industry's rather comprehensive feedback form allows visitors to rank the site's completeness of information; speed of delivery; understandability; attractiveness; ease of navigation; relevance of information; ability to interest the user; and overall rating. Like all other feedback mechanisms encountered, it also allows visitors to add any additional comments they may care to.

FOR OTHER MUSEUM PROFESSIONALS

Professionally-Oriented Information

Just over half of the sixteen sites evaluated (10 museums) provided access to information which would be of specific interest to other museum professionals.

The Whitney hosts a conference on ECHO, a New York City-based bbs which deals mostly with arts and literature issues. This particular conference deals with issues in American Art. Users are encouraged to join the conversation, view the archives of past dialogues, and participate in the occasional live chat discussion with noted museum professionals. An archives of 500 messages on "Race Matters: The Politics of Race in U.S. Art and Culture" is available. The ECHO gopher links also provide a calendar and additional information on "New York City culture, arts and institutions." It also provides access to an extensive gopher archives and a gopher search and retrieval interface for a series of chronologies such as the History of the Whitney, Annual and Biennial Exhibitions, Studio Club History, and Composers' Showcase Chronology.

The Canadian Museum of Civilization provides a link to its "Institutional Purpose," including relevant text from the Canadian "Museums Act" statute, as well as an "Institutional History" link which provides a chronology of the museum. This site also contains key extracts of the museum's strategic plan for 1993-1998 and information on its digitization project. The Ontario Science Centre provides a hypertext version of its 1994-95 annual report, including a financial statement. And both the Natural History Museum, UK, and the Oregon Museum of Science and Industry provide information on traveling exhibits that are available to other institutions.

The Swedish Museum of Natural History provides a link to ICOM and its ftp archives provides several files of interest to museum professionals, such as INSAM, a "coordinating body for computerization activities and information systems at Swedish museums." Files within the INSAM directory include INSAM statutes, back issues of its newsletter, and the first publicly released version of INSAM's "Uniform Procedures for Term Description in Swedish Museum Database Systems." In addition, the museum provides a

mailing list (listserv) gateway which is "intended to present information about a set of mailing lists, allow people to easily use mailing list commands, and provide a hypertext interface to list archives which exist on the museum's server." Archived listservs (both hosted here) include the ICOM's announce (ICOM-ANNOUNCE) and its International Documentation Committee lists (CIDOC-L). This site also provides a list of links to scientific collections and to current research activities at the museum in entomology, paleozoology, paleobotanics, palynology, phanerogamic botany, and vertebrate zoology. The Natural History Museum, UK, also provides links to its research activities and projects. For example, in entomology, there are hotlinks to projects, including beetle diversity on Tanzania, mini-wasps in Costa Rica, termite diversity, and the evolutionary biology of hawkmoths.

The Field Museum's quite extensive gopher service provides the text to reports interest to museum professionals, such as a report from Mitre entitled "Analysis and Recommendations for Scientific Computing and Collections Information Management of Free-Standing Museums of Natural History and Botanical Gardens," and the museum's 1993 Annual Report. Other items include such interesting resources such as the "World Inventory of Anatomical Specimens," a database of the skeletal and alcohol preserved specimens from 107 institutions surveyed between 1982 and 1986. Also available is information about the Andean Botanical Information System, "a collection of information from the floristic and systematic investigations of the phanerograms of Andean South America."

Finally, the Science Museum of London provides the full text to roughly 15 papers presented at the conference "Museum Collections and the Information Superhighway" hosted by the museum in May 1995. Also included are links to seminars and conferences and a bibliography of staff publications and current research of collection-based research since 1993.

Despite shortcomings uncovered in other subdimensions, institutional WWW sites seem to be opting to include information that would be of use to other museum professionals across the globe.

CONCLUSION

Unfortunately, for all four types of museums surveyed, the amount of digitized object offerings is not as robust as one would hope or expect. And, it is not entirely clear as to why this is the case. Copyright concerns? Cost issues? Unclear benefits? While museums may have sound justifications at this point in not offering a wide assortment of images, there is no clear reason why documentation was found to be so often lacking. Documentation is one of the crucial areas in the networked digital environment. It can help ensure that issues such as authenticity and ownership are well-managed in the digital realm. The WWW would also appear to provide an ideal mechanism through which to host non-current exhibitions, providing over future years rich collection tools of continuously available highly structured content.

Also puzzling was the absence of search and retrieval interfaces (not to mention indexes!) not only to collections but also to the sites themselves. Navigating through these is extremely time consuming and I often only encountered truly fascinating items after I had burrowed down quite a ways into these sites, finding items or information that was not clearly identified as being available higher up the WWW page chain.

Museums WWW sites should probably place greater emphasis in viewing their own sites as opportunities for outreach, rather than simply as mechanism for delivering assorted items and text from their holdings. Better use could be made of online solicitation of members and volunteers, as well as allowing potential visitors to make tour arrangements and find out comprehensive information on what events, lectures, films, etc. are currently available or upcoming in the future. Better outreach could also be enabled through the inclusion of detailed staff directories, including name, position, department, phone and e-mail address.

As for educational offerings, while listings of educational programs are always welcome, innovative uses of the distributed network environment to actually deliver educational programs instead of information about them is a truly exciting possibility that far too few have realized.

There seems to be quite a bit of hesitancy about conducting online credit card transactions, though these should be greatly minimized over the next six months as transaction software gains wider acceptance. Museums offering online feedback forms should communicate their results to the wider profession, thus helping to educate others in what does and does not work for virtual presences.

Despite these concerns, the state of museums on the WWW, as exhibited by these sixteen institutions, is considerably in advance of what was found previously for archival repositories. The latter would do well to visit their sister cultural heritage institutions to see how they can reengineer their public services.

CONFERENCES

The Museum Documentation Association, Edinburgh, November 6- 10, 1995

This years MDA conference continued a long tradition of important meetings and added the benefit of having Proceedings published in advance so that speakers were free to elaborate on their published papers and participants left the meeting with a valuable record.[1] I was particularly grateful, as the lead-off Plenary speaker (after the usual welcome from the Director of the National Museums of Scotland who hosted the meeting), to be able to depart from a long paper on organizational strategies for museums on the Internet to discuss the cultural and attitudinal challenges of reinventing museums. Following my talk the conference broke into a three tracks, broadly devoted to access, management, and technology, until the final day.

The variety of papers delivered in these sessions again made me glad to have the Proceedings. In the first time slot alone the participants heard from a museum director, curator, tourism marketer, education officer, exhibition manager, sites and monuments administrator, research advocate for the disabled, and a curator with disabilities on how the Internet was impacting on their work. After lunch a designer, auditor, documentation manager, media researcher, scholar, and edutainment representative were added. And then the conferees had several hours in which to look at exhibits.

Among the papers given on the first day were those by Peter Samis, "De-Concealing Meaning", which explored methods being used by museums in San Francisco to provide meaningful access to their holdings for new publics, and Ed Southworth, "Hunting the Unicorn,"

1 *Information: The Hidden Resource, Museums and the Internet.* Proceedings of the Seventh International Conference of the MDA, 1995. Edited by Anne Fahy and Wendy Sudbury (Cambridge: Museum Documentation Association, 1995). 424pp.+

which explored just what a researcher could find about museum holdings through online inquiries. The message in Peter's paper was largely upbeat: he said that although much of what museums hold is hidden, information especially if configured from lots of perspectives, can reveal what is hidden and make it meaningful and alive. His examples began to reveal what is different about networked information and multimedia and how they can transform museum programs. Ed Southworth's paper, on the other hand, illustrated how far we still have to go before a researcher can use electronic communications, including simple e-mail, to conduct research from museum collections. His simple strategy was to write an e-mail research inquiry to museums in the UK in search of carved narwhal horns and requesting information that he could explore online. What he found was that most museums lacked mechanisms to respond to such inquiries. If they could respond, they were unable to provide online access to finding tools and descriptions they used, and rarely could search across artifact catalogs, library and manuscript catalogs, image databases, and the like.

In other sessions over the next day, there were two quite technical papers on three-dimensional imaging by Lothar Paul and Alexander Geschke. They introduced methods and rationales into the discussion which I felt made an important contribution to thinking about the added value of 3-D and suggest the direction in which low cost 3-D data acquisition will move in the future. In addition, Maxwell Anderson from the Art Gallery of Ontario introduced the Association of Art Museum Directors (AAMD) web site.

On the final day of the conference, the format returned largely to plenary sessions. After a morning keynote speculating on museums in future, the session on the impact of technology in other sectors was a refreshing change of focus from the museum and to the immediate past. Chris Yapp (ICL) reflected on the experience of a company delivering life-long learning (just what museums supposedly do best) on museums. He reported that it was urgent to shift from collection to connections because museums have been using the technology to do what they already do well, but not as much to do new things which would truly involve participants in the use of resources for learning. His examples of how even very young children are using museum sites to conduct research lent substance to the message that life-long learning is life wide and life deep. George Sudbury (retired, Metropolitan Police) reported on the very large scale imaging initiative of police departments capturing fingerprint files and the ways in which these would be used.

After lunch, Mark Jones, Director of the host National Museum of Scotland, illustrated how far many traditional museum professionals and directors have to come before they understand the potential of the information revolution. Next, Jose-Maria Luzon, director of the Prado Museum in Madrid, presented a paper that showed that if museum directors do understand, they can inspire their staffs to take risks that produce extraordinarily interesting results. Unfortunately the session did not leave much time for discussion of the two contrasting views. Paul Omerod of Meta Generics, who was featured as a third speaker, provided useful data on the shape of information technology investments in Europe which enabled the audience to skirt the opportunity for true debate.

Nor did the discussion return to the fundamental question of whether the network was worth it, because Joanne DiCosmo (Executive Director, Manitoba Museum of Man and Nature) focused more on the human resource implications of these changes than on programmatic issues. Jennifer Stewart, who summed up on the implications for documentation (it was, after all, an MDA conference) used the opportunity to provide a panoramic revisiting of the types of questions raised by the three-day conference, rather than laying down new challenging propositions and demanding debate.

In the end, despite several valuable new papers, the meeting failed for me. It did not force any ideas to crystallize nor provide adequate opportunity for debate. The speakers too often read papers they had already submitted in writing as part of the Proceedings and the invitations to many outsiders to speak at the conference were not accompanied by enough context to enable them to make connections to issues faced by museums leaving that effort to the listeners, if a connection was to be made. On the other hand, the conference attracted a large number of international participants and served as an occasion for the usual, much needed, hallway chats (in this case largely conducted at a nearby coffee shop).

Electronic Imaging and Visual Arts
Florence, 5-10 February 1996

EVA Florence was to be a small workshop-like meeting, attracting fifty or so people for some in-depth technical papers. A meeting on EU policy the day before the conference and a session on the potential of G-7 and EU cooperation on the day following the conference transformed that. As many as 600 people squeezed into a freezing room in the hastily borrowed Palazzo Vecchio for the EU information day and large numbers stayed on for the public and private negotiations to merge some EU and G-7 initiatives which unfortunately did not lead to agreement on the final day. In between, the conference proper was one of the most stimulating events I've attended for years.

There was one track, running continuously from 9:15 am to 5:00 pm on the first day (with a brief break for lunch) and 9:15 am to 2:00 pm on the second. During that time about twenty-five papers were given, almost all of which were technically very sophisticated. The papers were available in Proceedings, and the authors used that fact extremely well, even though a very large majority were speaking in English which was not their native language. Their oral summaries were generally concise, at an appropriate technical level, and raised critical issues. Taken individually, they made significant contributions to the methods of imaging and the reasons for doing so. Taken as a whole, the conference focused a shift in the past two years from authored and compiled hypermedia to architected and designed products. I will explore this issue further after reporting some of the important results from individual papers.

I missed the first couple of papers by arriving somewhat late on a flight from Rome, but Wendy Sudburys lead paper, if it followed the published piece, outlined the rationale for continued standardization efforts by the MDA and its commitment to open standards to enable museum data to acquire value in the market. A subsequent paper by a large Italian team centered at the CNUCE/CNR (directed by Roberto Gagliardi; robert@cnuce.cnr.it) described ARCADIA (Arts and Crafts Multimedia Encyclopedia) whose objective is to create a repository of multimedia documents reflecting the history of techniques and applications in a specific branch of arts, crafts, or industry. These documents have chunks which are not just images but functionally complex representations which peel back layers, animate steps, focus on elements, and otherwise carry didactic and training content. The challenge to museums as sources of data is made most explicit in such endeavors. On the one hand, the source materials and knowledge to shape them into value-added chunks clearly resides in museums, but on the other hand the museums are not now making generic digital content that is of much value to publishing efforts such as these. A prototype of the system showing the history of glassmaking techniques was shown at the meeting and was quite impressive.

The conference was the occasion for awarding the European MUSA prize, an award given (annually since 1994 in Italy, but now in Europe as a whole) to recognize multimedia authors for an as yet unpublished work. The concept behind the prize, which is to be given by multimedia publishers in collaboration with the European Commission, is that because the multimedia industry requires teamwork, publishers and buyers have not yet paid adequate attention to the creativity at the source of good multimedia products which is the authors. By giving a prize to young authors which assures winners of a publisher for their ideas, the MUSA prize Secretariat (Dr. Luisella Romeo; luisella@unive.it) hopes to encourage multimedia authorship as a career and build relationships between authors and publishers such as those present in print media. In her paper, describing the prize submissions and discussing trends, Dr. Romeo noted the increase in number of multimedia formats and the inclusion of larger numbers of tools for readers in this years submissions. She also noted the continued absence of typed links, perhaps in part because the focus on authorship suggests hand-made links would be preferred over algorithmic ones (but made it clear this was not so).

During the conference as a whole, a wealth of papers were given which could be described as reports on particular repositories the Tuscany Visual Arts Archive, the Alinari Archive, the GRACE project (Guided Tour of the Renaissance in Arts and Culture), the VENIVA project, the Amendolara Archaeological museum, the Poldi Pezzoli Museum of Milan, and SCRAN in Scotland. Although details of the state of these projects are interesting, I will report on papers with a more

technical orientation because I felt that the real contribution of EVA is to technology and that these papers were especially distinguished.

Color was by far the technical challenge that attracted the most attention. The first paper, "Color Certification by Broad Band," was prepared by a five-person team from the University of Florence and three curators from the Uffizi Gallery. It described a method of correcting color reproductions from commercial scanners by comparison with scans taken from the very high end VASARI scanner and transmitted over high speed networks. The VASARI scanner uses seven spectral filters to span visible wavelengths as opposed to the three bands (RGB) scanned by even the best commercial scanners. Color accuracy is ensured by a calibration procedure and standard light is ensured by a uniform white illuminant which is part of the scanner. The paper defines the differences and how they are corrected both in mathematical terms and as a procedure. Im less sure of the actual value of the proposed color correction service since it would probably make more sense to acquire a better image than to color correct from the in-house scan of a photograph.

A paper by R. Schettini, et. al. (centaura@itim.mi.cnr.it), discussed a fuzzy strategy for querying databases by color distribution, recognizing that current schemes for searching by color often miss similarities and that background and adjacent colors introduce noise in retrieval. In this experiment on perceptual similarity, the authors begin with the ANSI IT8:7.2 color target and CIELAB standard coordinates to calibrate the image and enable mapping it to the RGB color space of the display. This data, indexed with the image, is used to partition the color space into 256 subspaces which are perceptually distinct from their neighbors (related to the Inter-Society Color Council and National Bureau of Standards 1955 color naming standard with its 267 categories). Value assignments are made by a feed- forward neural network whose effectiveness was tested on textiles with good results. Obviously, color must be accompanied by shape, texture, distance, size, and relative position in automatic querying of images, but this method suggests one way to discriminate usefully between color differences.

In their paper "Color image query and retrieval based on pictorial semantics," A. DelBimbo, et. al (delbimbo@idea.iug.unibs.it), describe

the application of a formal chromatic grammar, named Color Description Language, based on a proposal made by Johannes Itten in 1900. The language, which accommodates concepts as complex as warmth, harmony, and contrast is associated with an image processing and analysis module which performs queries.

Capturing images with additional data in them was a major theme of the technical papers. P. Grattoni, et. al. (grattoni@cstv.to.cnr.it), reported on the use of a 3EYES device for acquisition of faithful images from three- dimensional painted surfaces like frescoes and mosaics. The device, which consists of three cameras in a fixed frame takes a large number of partially overlapping images which are then linked together. The central camera, with a wide angle lens, is used to locate the image tiles taken by the other two cameras which focus on the same part of the original and produce a stereo image that can be calculated to yield three-dimensional data. The difference in reflection to the two outside cameras also corrects for color reflectance and allows curved surfaces to be accurately represented (without distortion). The knitting together of overlapping images, of course, provides the opportunity for 1:1 data capture resolutions.

G.M. Cortelazzo and colleagues (corte@dei.unipd.it) reported on an inexpensive method for electronically displaying paintings at predetermined spatial resolutions, which goes part of the way towards making electronic digital formats much more meaningful than analog ones. The ability to show objects in relative size (preferable at 1:1 image/object ratio) requires the kind of mosaicing of images described in the previous paper and the realization that the position of the viewer and comparative size of objects is a critical piece of information for the human brain to make sense of an image.

Of course, images need not exploit only the power of the human eye and brain. In their paper P. Mazzinghi, et. al. (mazzinghi@mailbox.ieq.cnr.it), explored the value of digital florescence imaging in restoration of paintings. Using ultraviolet light sources rather than visual light they were able to capture differences in chemical and physical properties of the materials within paintings (such as varnish and pigment layers) that detect repainting or expose potential deterioration which would be

invisible to the human eye. In particular they reported on experience using recently available high resolution, high sensitivity CCD arrays.

Beyond data capture, there were a number of papers dealing with use of content, including a technical paper on watermarking technology and a socio-legal one on copyright which I thought were based on false premises. Over the years we have become used to having one of the most exciting papers at any hypermedia conference delivered by Oreste Signore and his colleagues (O.Signore@cnuce.cnr.it); this meeting was no exception. A prototype hypermedia application developed for the Botanical Garden of Pisa was designed to communicate with the WWW in order to provide a dynamic web page whose content reflects the interests of the potential user. The prototype uses link tying and link type profiles of users to dynamically create pages that have navigation paths of interest to the reader. Behind the page definitions are a relational database accessed by SQL whose results are reported to readers in HTML, thereby appearing to provide an almost infinite number of pages within a single page definition. Signore's work in algorithmically extending links makes possible the implementation of feedback loops that attribute weight to particular link types when activated by users and become increasingly knowledgeable about the users interests. Check out the Pisa Botanical Gardens site!

Towards the end of the last day, Jennifer Trant (JTrant@getty.edu) and I (dbear@lis.pitt.edu) teamed up to give two papers on the economics of administering cultural intellectual property and the state of the Museum Educational Site Licensing (MESL) project. My more general paper examined the failure of the current model for image rights acquisition due to its overwhelming transaction costs and laid out the conditions for a successful end-to-end licensing scheme, including a framework for analysis of the economics of collective licensing by site license as in MESL. Jennifer's paper examined MESL progress to date, detailing the cooperative agreement, image selection mechanisms, data distribution methods, and evaluation and measurement plans. Both papers are also available at http://www.ahip.getty.edu/mesl/home.html along with vast numbers of other project reports.

Functional Requirements for Evidence in Recordkeeping: Invitational Meeting University of Pittsburgh, 1-2 February 1996

The University of Pittsburgh's three-year research project on functional requirements for recordkeeping completed its work in January and held a meeting for an invited group of electronic records experts to consider the next steps. As the principal consultant to the project, I was personally delighted to have the opportunity to detail what we felt had been, and had not been, achieved during the three years and to turn over to others who are pursuing implications of the project the final form of the integrated documentation that has been circulating in draft for the past several years.

After a brief introduction to the project by Principal Investigator Richard Cox, who examined its original hypotheses and the various strands of work we undertook, the meeting turned to examining the major substantive products. Specifically, we unveiled the final version of the "Functional Requirements for Evidence in Recordkeeping" which I presented from the project WWW site (www2.lis.pitt.edu/~nhprc) where they are hyper-linked upwardly to the "Literary Warrant for Evidence" (presented at the conference by Wendy Duff) and downwardly to the "Production Rules for Evidence in Recordkeeping" (presented by Ken Sochats). In addition, I presented the "Metadata Requirements for Evidence in Recordkeeping" and their relationship to the proposed "Reference Model for Business Acceptable Communications."

Those who have been following the project will note a subtle but important shift in the way the results are being framed. In place of the earlier formulations initially functional requirements for electronic records management and subsequently functional requirements for recordkeeping we have begun to use the term functional requirements for evidence throughout. This reflects a realization on our part that other groups looking at functional requirements of records management systems, particularly those at the DoD and University of British Columbia, were focused on the application functionality required to support a business process called records management. These business

process requirements for automation of an archives or records management function include many sources of requirements, such as security, interface design, network management, search and retrieval, and application support which are completely absent in our model. While we believe that we have made it clear previously that we derived the requirements based on what constitutes a record, not on how it was managed, we felt that the new formulation (functional requirements for evidence in recordkeeping) makes the limitation we adopted more explicit. At the same time, we believe, it makes the specification more universal, because it has equal weight regardless of the specific business processes engaged in by the archives or records management unit.

The second difference in the final versions of the products is that they are all tightly linked, both conceptually, and for purposes of Web display, functionally. Previously we had asserted this linkage but not created a product in which the links were explicit and navigable. Now, in the HTML version of the document these links can be navigated upwards and downwards. Also some findings of the project, such as the legitimacy of different sources of literary warrant to different professional groups, led us to support alternative pathways into the requirements (in this case by profession).

After a morning of discussion of these products, the meeting heard reports from invited participants on the ways in which their projects were exploiting the project results (obviously based on the preliminary reports to date). Rick Barry (rickbarry@aol.com) reported on how the functional requirements were used in an evaluation of electronic filing system requirements at the World Bank in the second quarter of 1995. The internal question was how to define benchmarks for automated records management software functionality and the decision was to apply the functional requirements and an early draft of the literary warrant. Barry felt the requirements were useful for this purpose, noting that the warrants in mid-1995 were often specific to a particular jurisdiction, applicable to a narrow area of commerce, or nearly impossible to satisfy and that at that time not all the functional requirements had warrant. Like the project team itself, he also reported that tactics do not apply well at the level of individual functional requirements and urged that training be integrated into the project plan.

John McDonald (National Archives of Canada) reported on the application of concepts from the Pittsburgh study in the evolving Electronic Work Environment (EWE) framework in Canada. In particular, John has been applying the concept that transaction context reflects the location of the communication source and target within the business process model of the agency. He has been exploring how to introduce users to the selection of transaction icons in order to launch software so that the appropriate contextual metadata will automatically attach to each transaction.

Margaret Hedstrom (now at the University of Michigan) reported on her experience in New York State applying early versions of the functional requirements and explored her hopes for the way these might be used in the future.

Mark Giguerre (Philadelphia City Archives) explained how the functional requirements, and more particularly the metadata specifications and the concept of metadata encapsulated records has been incorporated into the acquisition of a new human resources management system (HRMS) for city government. For about six months, the committee of users, computer systems staff and archives and records staff have been formulating requirements for an RFP for a new, commercial HRMS to replace the legacy system in current use. Integrating the metadata specifications and requirements for encapsulation into the RFP was considered a cost saving measure over the longer term and a means for satisfying accountability requirements in the short term. Cost analysis and architectural considerations have led to some modifications in the Pittsburgh specification which are grounded in local realities.

Philip Eppard (State University of New York at Albany) incorporated the functional requirements into the prose Guidelines for Management and Preservation of Electronic Text Documents which his office developed for SUNY administrative offices system-wide. The specific warrants cited by his document were examined in the context of the more general warrants developed by the project.

Harold Thiele (Vermont State Archives) detailed a series of on-going efforts involved in the overall Vermont Information Strategy Plan

(VISP), including functional analysis and decomposition of state government and the linking of accountability to evidence which have relied on the Pittsburgh research. The January 1996 Accountability Function Decomposition Packet which he presented would not have been identified as a major function of government (and wasnt identified by the original consultants) without the work of the past several years on recordkeeping. Much of the detail in the decomposition relates back to the functional requirements for evidence and to ideas expressed by Bearman and Hedstrom in new paradigms of electronic records management program strategies. The Vermont project has also developed a decision-tree model of responsibility for accountability at different levels which finds support for its criteria in the Pittsburgh functional requirements. One of the most interesting aspects of the dovetailing of the two projects is the way in which Vermont has developed detailed warrant around specific parts of the recordkeeping process in particular in a detailed document on the warrant for imaging systems assessment criteria.

Finally, Philip Bantin (Indiana University) examined how functional requirements for evidence influenced the design of a university wide information repository system now being implemented. The project has only recently gotten underway, but the initial functional analysis of recordkeeping systems in the Human Resources area already revealed some of the same relationships between specific steps in that process (particular transactions) and long-term records retention requirements. The work also revealed the connection between specific warrants and specific retentions.

Following these presentations, the meeting briefly examined written submissions from several other projects using the functional requirements, literary warrant, and metadata specifications including: a report by William Landis (bill_landis@cc.cranbrook.edu) and Robert Royce (bobroyce@umich.edu) who applied the functional requirements to a small graphic design company records management system a public policy brief by David Roberts for the State of New South Wales which is available at http://wilma.silas.unsw.edu.au/records.htm the draft Policy for Electronic Recordkeeping in the Commonwealth Government published by Australian Archives a paper by Vicki Wilson and five colleagues published in Informa on electronic recordkeeping in Western

Australia Public Sector Agencies the preliminary draft Victorian Government Electronic Recordkeeping Strategy, and testimony from colleagues in the Netherlands about their use of the research to date in shaping Dutch government programs.

The group devoted a final couple of sessions to analysis of future research requirements and how best to explain and promote the findings of the project to date. These deliberations will be written up by Richard Cox who together with his colleagues at the University of Pittsburgh, and Margaret Hedstrom at the University of Michigan, is planning the establishment of an Electronic Records Research Center which will be an information clearinghouse and a venue for conducting additional work. One step toward playing that role was to open the project web site and include reports of how others are using the results of the project (including the papers discussed above). For further information about the project and follow-on activities at the University of Pittsburgh, contact Richard Cox (rjc@lis.pitt.edu or 412-624- 3245).

Archives in Cyberspace: Electronic Records in East and West. An International Workshop of the Association for History and Computing Moscow, 4-6 January 1996

by Margaret Hedstrom, University of Michigan.

This workshop on Archives in Cyberspace in early January brought together experts on archiving and preservation of digital information from twelve countries in Moscow. Approximately seventy participants from the former Soviet Union attended the conference which was sponsored by INTAS in Brussels, the Historical Faculty of Moscow State University, the State Archives of the Russian Federation, the Moscow City Archives, and the Russian Foundation for the Humanities. Besides the opportunity to learn about the current state of electronic records and data archives in the former Soviet Union and Eastern Europe, the workshop was also a chance to see whether Western archivists from

traditional archives and data archives shared any common perspectives on how to approach the legacy of electronic records in the East.

The conference was organized along the themes of traditional archival functions: appraisal, selection, and acquisition; cataloguing, documentation, and description; storage and preservation; and providing access. Unfortunately, this set of themes may have constrained creative thinking about the options for salvaging an undoubtedly valuable accumulation of data without taking on untenable custodial responsibilities. In the opening lecture, Charles Dollar discussed changes in information technology and lessons learned since the early pioneering efforts to preserve machine-readable data files in the 1960s and 1970s. He drew parallels between the early salvage operations at the U.S. National Archives and some of the challenges facing colleagues in the East. Dollar stressed that while archives may have to resort at times to salvaging data that is in great jeopardy of loss, the archival community has developed a wider range of strategies for dealing with electronic records.

Tatyana Moiseenko, of the Inter Documentation Company in Leiden, presented a summary of her exhaustive study of Russian archives and electronic records, which she prepared for the conference. The report describes the electronic records producers in Russia, discusses numerous organizations that are involved in preserving electronic records, describes the legal context, and then analyzes the methodological and conceptual approaches to archiving electronic records. It is interesting to note that because most of the archives in the archival system of the Russian federation are not prepared to cope with electronic records, other organizations have taken the lead in this area including specialized, decentralized data banks and archives affiliated with major research institutes in the humanities, social sciences, and sciences. Efforts are also underway to create and collect metadata about these decentralized archives, such as the Scientific Research Center's "Informregistes" for registration of scientific databanks.

My paper on custodial and non-custodial approaches raised considerable controversy. Not surprisingly, representatives of the established data archives in England and Scandinavia took exception to the non-custodial approach. Fortunately, Peter Doorn, director of the Netherlands Historical Data Archive, followed up with an excellent paper on "Research Data Archives and Public Electronic Records Offices: What Can We Learn from Each Other?" Doorn's paper established a useful framework for differentiating roles and appropriate methods for Social Science Data Archives, Electronic Text Archives, Historical Data Archives, and Public Electronic Records Offices. In conclusion he urged those involved with research data archives to pursue non-custodial approaches so that data archives become "information brokers rather than data vaults" for increasingly massive and complex data sets. His conclusions confirmed that traditional archives and data archives can share a common mission of knowing where digital information exists in its various manifestations and helping users locate it if we move away from custody-driven approaches.

The papers will be published in Russian for the annual meeting of the Association for History and Computing which will be held at Moscow State University in August 1996. An English version may be published later this year.

Networked Information in an International Context, London, 9-10 February 1996

by Paul Peters, Coalition for Networked Information

Librarians, information technologists, and academics from the United Kingdom and the United States attended the "Networked Information in an International Context" conference in London on 9-10 February 1996. They concluded that today's global information society provides many opportunities for multi-national collaborations on networked information projects.

The conference was sponsored by the UK Office for Library and Information Networking (UKOLN) in association with the Coalition for Networked Information (CNI), CAUSE, the Joint Information Systems Committee (JISC) of the three UK Higher Education Funding Councils, and the British Library (BL), and was the first joint effort these groups.[1]

It facilitated communication about networked information priorities, strategies, and issues among senior managers of information resources. In addition, the conference showcased initiatives in networked information in the US and in the far-reaching and well-organized UK initiative known as the eLib Programme.

In her welcome to over 150 attendees, Lynne Brindley, chair of the UK Library Programme of JISC, noted that "all of the boundaries are disappearing," as exemplified by the speakers from both sides of the Atlantic and the many sectors of academe represented on the program: faculty, librarians, information technologists, academic administrators, and others. She commented that JISC has pushed a program featuring information and its management as well as strategies for service delivery. She noted that through membership in CNI's Task Force and contact over the past few years, JISC had been influenced by CNI in the development of its program. Paul Evan Peters, Executive Director, Coalition for Networked Information, also welcomed the attendees and called for those present to ensure the building of an infrastructure that serves the needs of global science and scholarship.

In the keynote address, Sir Brian Follett reported on the achievements, plans, and problems of the University Libraries Review Group of the Joint Information Systems Committee. The primary vehicle for addressing the recommendations of the 1993 Follett Report (http://ukoln.bath.ac.uk/follett/follett_report.html) was the establishment of the eLib Programme, chaired by Lynne Brindley at the London School of Economics and led by Chris Rusbridge at the University of Warwick (http://ukoln.bath.ac.uk/elib/). This ambitious initiative has a budget of about 15 million pounds over three years. Its objectives are to use IT to improve delivery of information through increased use of electronic library services, to allow academic libraries to cope better with growth, to explore different models of intellectual property management, and to encourage new methods of scholarly publishing. Currently, the eLib initiative is funding fifty projects in the following areas:

- Document delivery,
- Electronic journals,
- Digitization,
- On-demand publishing,
- Training and awareness,
- Access to network resources,
- Supporting studies, and
- Images.

New initiatives will be in the areas of preprints and gray literature, quality assurance (refereeing), and electronic reserves. Sir Brian closed his remarks on the eLib initiative by noting that the time is approaching when the developers must take the projects from experimental stage to the mass implementation stage, and it will be important to integrate the eLib projects with each other as well as with similar projects outside of the UK. In this way, we will build the infrastructure for the digital library.

The second plenary session included presentations by Terry Cannon and John Mahoney of the British Library. Cannon described the long history of research on electronic library projects by the BL and noted that partnerships and joint funding will be a large part of BL's future. He described the success of the UKOLN effort that has resulted in a powerful facility for awareness, advice, research, and standards. He also described the increased interest by the BL in networking projects in all types of libraries. Mahoney stated that the BL's goal is to be a major center for storage of and access to digital texts required for research by the year 2000. They are supporting pilots and demonstrations to exploit networking and information technology for developing new services. In their vision of the digital library, there will be:

2 The UK Office for Library and Information Networking (UKOLN), funded by JISC and the British Library, provides research, coordination and information services to the UK library and information communities. The Coalition for Networked Information (CNI), a joint project of the Association of Research Libraries, CAUSE, and Educom, promotes the creation and use of networked information resources and services that advance scholarship and intellectual productivity. CAUSE is the association for managing and using information resources in higher education. The British Library is the national library of the United Kingdom and exists to serve scholarship, research and innovation. The Joint Information Systems Committee (JISC) was founded by the three Higher Education Funding Councils to stimulate and enable the cost effective exploitation of information systems and to provide a high quality national infrastructure for the UK higher education and research councils' communities.

* Integrated access to the BL and other collections,
* Organized and indexed digital collections,
* Digital collections integrated with traditional library collections,
* Increased access,
* Assurance of continued availability of information resources,
* Staff who have needed competencies to manage and service digital libraries,
* Digitization processes for conservation and access,
* Balance between intellectual property rights and "fair dealings," and
* Substantial investment in digital libraries by the BL and partners.

In the closing plenary session, Richard West, Vice Chancellor California State University and Chair of the CNI Steering Committee presented his view of the changing costs of information in the networked environment. He described a framework, developed through an Association of American Universities (AAU)/ Association of Research Libraries (ARL) process, which examined the potential effect of digital information resources on universities' costs for acquiring, storing and delivering information. West noted that currently our strategies for the electronic market are based on our practices in the print environment We expect savings through resource sharing and savings in the acquisitions budget. However, in the networked information environment, savings may be in other areas, e.g., storage, access, and circulation.

In addition, improving technology enables conceptual changes in our view of the scholarly communications process. For example, we can eliminate the presumption that the end result of the scholarly communication process is a print publication. In conclusion, West stated that mixed models of scholarly communication are inevitable in the transition period. He urged the attendees to focus on increasing support for fair use in the electronically empowered network environment, to explore cooperative content agreements with information providers that maximize economies of scale, to keep public information in the public domain, to invest in local campus networks, and to encourage a competitive market in scholarly information content five topical areas.

At the close of the meeting, Paul Evan Peters called for more learning by doing, specifically supporting some cooperative and collaborative initiatives between US and UK projects. He suggested joint projects, replication of projects, exchanges of personnel, and workshops as possible follow-ups to this meeting. He also encouraged the sponsors to consider addressing such cross-cutting perspectives and issues as economic models, strategis standards, assessment and performance measures, access by the disabled, preservation, new learning communities, and collaboration. Finally, he called for the next steps of the sponsors to be carried out in a broader international context.

Following the main meeting, invited delegates of the US and UK met to evaluate the completed meeting and to discuss next steps. These leaders expressed commitment to the expansion of partners to involve additional countries, voiced a strong desire for joint projects and exchanges of personnel, and expressed enthusiasm for building on the success of this conference.

Electronic journals

The CLIC Electronic Journal Project by Henry Rzepa, Imperial College

UK Internet Archaeology: Overcoming the Obstacles and Using the Opportunities by Seamus Ross, The British Academy, UK

From Ephemeral to Integral: Collaborative Management of Electronic Journals by Barbara Allen, CIC Center for Library Initiatives, US

Teaching and learning

New Learning Communities in the Networked Environment by Jana Bradley, Indiana University at IUPUI

US Technology Enhanced Language Learning: A Consortium Approach by Graham Chesters, The TELL Consortium, University of Hull, UK

IT POINT: Networking in the Community by Gulshan Kayam and Sue Turner, IT POINT Project Solihull, UK

Management and service issues

Information Services: Threat or Opportunity by Richard Field, University of Edinburgh, UK

Empowering the Millennium Citizen: Public Library Networking Initiatives, The Library Association Millennium Project and Project EARL by Philippa Dobson, LA/EARL/UKOLN Joint Public Libraries Networking Initiative, UK

Collaboration: Partnerships between Librarians and Information Technologists by Joan Lippincott, Coalition for Networked Information, US

Networked information discovery and retrieval

A Summary of the Findings of CNI's NIDR Research Initiative by Clifford Lynch, University of California, Office of the President, US

The Subject Approach to Network Navigation by Nicky Ferguson, University of Bristol, UK

Resource Organization and Discovery by Lorcan Dempsey, UKOLN, UK

Technical issues

Electronic Support for Scholarly Communication: Developing an Electronic Community by Dov Gabbay, Imperial College, UK and Hans Jurgen Ohlback, Max Planck Institute, Germany

Administrative Computing Meets the Web: Discover the Possibilities by David Koehler, Princeton University, US

CALENDAR

♦**April 26-May 1** Miami Beach, FL, ARLIS Annual Conference [Susan Kruse, Conference Mgr., 4101 Lake Boone Trail, Ste, 201, Raleigh, NC 27607; 919-787-5181; fax 919-787-4916; e-mail: skruse@interpath.com]

♦**May 4-8** Minneapolis, MN, AAM Annual Meeting & Museum Expo 96 [AAM, Dept. 4002, Washington, DC 20042-4002; 202-289-9113; fax 202-289-6578]

♦**July 17-20** Washington, DC, NAGARA Annual Meeting [Steve Grandin, NAGARA Pulications & Member Office, 48 Howard St., Albany, NY 12207; 518-463-8644]

♦**July 22-27** London, UK, EVA '96 [VASARI, Clark House, 2 Kings Road, Fleet, hampshire, GU13 9AD, UK; +44 (0) 1252-812252; fax +44 (0) 1252-815702; e-mail: jamesrhemsley@cix.compulink.co.uk; compuserve: 100577,1546]

Reports

* United States Advisory Council on the National Information Infrastructure, "A Nation of Opportunity: Realizing the Promise of the Information Superhighway" (30 January 1996).

In September 1993, the administration launched a major initiative under the Department of Commerce to make the Internet an engine of economic and social change. In January 1994 the President formed a public advisory council consisting largely of representatives of industry together with a few representatives of "public interests," to advise the government, and especially the Vice President who took a personal interest. The job of the Advisory Council was, essentially, to find acceptable common ground in areas that raised major policy choices. After two years of deliberations, they have issued a final report which spells out a centrist vision and policy. Some hard choices are buried in the report, but first let me summarize what in the 1990s climate must seem the obvious conclusions.

The Council asserts that the private sector must be the builder of the Information Superhighway, that communities are key to providing access, that the governments role is that of a catalyst and that individuals must take charge and be champions of the opportunities the I-way provides at the local level. These roles are reflected in recommendations for electronic commerce (the government clears the regulatory and legal barriers so others can do it), education and lifelong learning (communities use the private sector), emergency management, public safety and health (governments at all levels cooperate), and government information and services (all governments are to provide pointers to their information for public access). Other recommendations were intended to ensure access for all by having government provide explicit subsidies applied in a neutral manner to enable universal access and service, but act only when commercial and competitive forces are failing to achieve these goals. In order to achieve the ends desired, the Council proposed "rules of the road" for intellectual property (public education and harmonization of international laws), privacy (a set of principles and a recommendation to review existing laws to ensure conformance to these), security (private sector awareness and not discouraging the use of encryption), and free speech (not regulating content).

Those sensitive to the public policy issues confronting Information Superhighway deployment will recognize that the landmines are hidden in these rules of the road. While many issues are finessed in the final report, the Council made some hard choices in these areas. On intellectual property their principles that adequate and effective protection is essential, that copyright applies to works on the I-way but must keep up with technological developments, that existing rights of owners and exceptions of fair use should be protected, and that the government needs to create both a domestic and international environment of respect for electronic intellectual property are more fully spelled out in the Council's 12 December 1994 letter to Commissioner of Patents and Trademarks, Bruce Lehman, responding to the preliminary draft of the "Green Paper" (reprinted in the report on pp. 90-99). Similarly the principles advanced by the Council on privacy and security, which include opposing the Administration's effort to restrict private encryption, should also be read in conjunction with the letter to OIRA Administrator, Sally Katzen, dated 25 October 1995 (reprinted on pp. 100-106). The Council took a strong stand against censorship, in its report and in a letter to Secretary of Commerce, Ronald Brown, dated 12 December 1995 which unequivocally stated that "the Council believes that the rights of free speech should not be abridged in the digital age."

Overall the record of the Council during its two years of deliberations reflects the social and economic tensions that are accompanying the transition to a networked society. With the completion of its assigned mission, the Council is dissolved but it is leaving behind funded "legacy" activity administered by the Benton Foundation and a number of initiatives, one of which (KickStart) is the subject of a companion report. On the whole, its existence and its collective actions served to force some debate and to pressure the Administration in several important respects.

* United States Advisory Council on the National Information Infrastructure, "KickStart Initiative: Connecting America's Communities to the

Information Superhighway" (January 1996)

The KickStart Initiative is essentially a call to action, issued by the Advisory Council to the leadership of communities across the nation. It urges them, and suggests roadmaps and tactics, to "bring the Superhighway to the neighborhood to schools, libraries and community centers." This report is designed to be a toolkit and resource for those community leaders. The premises behind the call for action are simple: the Council believes the Information Superhighway can improve the lives of individuals, reinvigorate education, expand business, and strengthen communities. Further it believes that the "costs are manageable and sources of funds are available to communities and persistent" which is what local leadership most wants to hear. Most of the ideas, case study vignettes, resource guides, and contact lists which occupy the body of this 175 page report should be helpful.

* Task Force on Archiving Digital Information, The Commission on Preservation and Access and the Research Libraries Group, "Preserving Digital Information," draft version 1.0 (30 November 1995).

Recognizing that digital knowledge is subject to loss as a consequence of its hardware and software dependency, the Research Libraries Group and the Commission on Preservation and Access establish a task force on "archiving" digital information in December 1994. A year later, it released a draft report of its conclusions on how best to avoid loss by relying on migration of digital information over time within the context of an infrastructure and set of social agreements that will support systematic re-presentation of knowledge. The core argument, that archives must move beyond "refreshing" to "migration," assumes that the losses involved in generations of knowledge representations are unavoidable. This, in turn, assumes that no adequate abstract (metadata) representation of the original can be processed over time if it was retained with an exact copy of the original on contemporary media. While their argument is sophisticated, I believe it is wrong. I think they arrived at it by not understanding the difference between migrating data and migrating metadata. Their stance encourages a definition of "archiving" which will be dangerous because it rationalizes making changes based on what is still an art rather than a science and accepting effects that are not reversible. Like classical preservationists, I would prefer the conservation processes I endorse to be reversible.

The Task Force defines digital archives functionally "as repositories of digital information that are collectively responsible for storing and ensuring, through exercise of various migration strategies, the long-term accessibility of the nation's social, economic, cultural, and intellectual heritage instantiated in digital form." They imagine a system of certified archival repositories and a fail-safe mechanism that ensures no archival data will be lost, even if the creator/owner fails to protect it. From there, the report examines the operating environment of digital archives, strategies for migration, intellectual property issues and costs of the infrastructure. It concludes with recommendations designed to build a consensus.

For reasons that make no sense to me, the Task Force focuses on digital objects that can be reduced to print, even though other types of objects are "likely to become increasingly dominant in future archives." The consequence is that they imagine a strategy for preservation that is based on the simplest types of migrations, and then extend the overall strategy to types of migrations in which it won't work. Their typology which asserts that "relevant" aspects of knowledge representation are embodied in low level encoding, source (but not actually contextual source, only responsibility), mode of distribution, referential qualities and dynamic qualities does not seem adequate to me, even with the kinds of examples they provide. Their view of the life cycle of information and stakeholder interests at points in that life cycle is based on a model of the world of publishing and not on the day-to-day interactions of people in organizations which is more familiar and meaningful to archivists.

For example, the first principle they establish, that "as long as they hold copyright, information creators/providers/owners have initial responsibility for archiving information objects and thereby ensuring the long- term preservation of those objects," ignores the fact that the vast majority of information objects are not created for publication and are retained, if at all, for convenience. Copyright is not asserted in them, but resides in them as unpublished objects, and the stakeholders not only do not have an interest in the societal

preservation of these objects, they may be actively opposed to any such interest.

The second principle espouses the notion that certified archival organizations "have a right and a duty to exercise an aggressive rescue function as a fail-safe mechanism to preserve information objects that become endangered." This is frankly silly without some concept of how the archives would determine the significance of objects and what decisions about selective retention (essentially triage) they would exercise. The whole model, which has relevance to the world of published information traditionally occupied by libraries, is impossible in the world of records traditionally occupied by archives. And the Task Force report displays only an occasional concept of records, and shows little appreciation of their fundamentally different metadata characteristics or business purposes.

Considerable attention is devoted to how to define a role acceptable under the copyright act, but less attention is paid to the reality that most of the digital dependencies are not covered by copyright but by licensing, trade secrets and firmware. Reasonable people will have little trouble accepting the framework proposed by the Task Force for maintaining an archival reference copy, but this will not solve most of the intellectual property problems unless copyright is used as the primary strategy for protecting intellectual property which I find increasingly doubtful.

Finally, the Task Force discusses the economic issues associated with distributed digital archives and demonstrates convincingly that if such repositories are used as distribution sources for information required on demand elsewhere, they are highly cost effective. In this I fully concur and welcome their demonstration of the evident advantages of distributed stores. However, I think they could make the case more convincingly if they factored in the different technologies that would have to be maintained by any organization attempting to be a central, or redundant, storage facility.

Overall the report is a fascinating mixture of excellent discussions of options suggested by incorrect premises. Many of the best minds of our field have been involved in the Task Force and much of their analysis is very rich and subtle, but I think the entire effort went astray in many of its initial assumptions, and therefore found the recommendations which cap the report faulty. I'm encouraged however by a series of long exchanges I've had this month with Margaret Hedstrom who serves on the Task Force and understands these issues well. She hopes to bring some of these distinctions into greater focus in the final report which is now expected in late spring of 1996.

Articles & Books

* Robert H. Anderson, Tora Bikson, Sally Ann Law, Bridger M. Mitchell, et. al., **Universal Access to E-Mail: Feasibility and Societal Implications** (Santa Monica, Rand Corporation, 1995) 267 pp. also available at: http://www.rand.org/publications/MR/MR650/

With support from the Markle Foundation, Rand researchers asked the deceptively simple question: "What if e-mail were as ubiquitous as telephones, TVs and VCRs?" They concluded that e-mail has benefits to individuals, organizations, and society which are sufficient to argue for a public policy that supports universal access. They determined that inter-system connectivity would occur through market forces but that connection of some individuals to networks could only occur through appropriate policy remedies. Person-to-person communication was found by the authors to be the most critical contribution of the NII and therefore it was ranked as the functionality to which it was most important to provide affordable and level access. The study found no technological barriers and no requirement for government involvement in directories or other service provision. It found a role for government in establishing a national email addressing scheme, maintaining competition through telecommunications policies, enabling targeted access support funding through tax assistance, and supporting the spread of connectivity abroad in furtherance of democratic foreign policy objectives.

* Michel Cote and Annette Viel, **Museums: Where Knowledge is Shared** (Montreal, Muse de la Civilization, 1995) 331 pp.

These proceedings of the Canadian Museum Association/La Societ des Muses Quebeois meeting in Montreal in June of 1995, contains a series of twenty essays on the question of the relationship between museums and knowledge. The overall emphasis is on visitor involvement, evaluation, and

outreach and the papers present the best of recent thinking on a range of basic museum issues. Computers rarely raise their heads, but information delivery implications abound.

* **Museum Collections and the Information Superhighway: Proceedings of the Conference on 10 May 1995**, edited by Giskin Day (London, the Science Museum, 1995). 95 pp. Copies available from Dr. John Griffiths, conference organizer (dj.griffiths@nmsi.ac.uk or at www.nmsi.ac.uk/infosh/infosh.html).

These are the proceedings of a one day conference held at the Science Museum in London last year. The talks and the discussion are well represented in the report and the pace of activity left little room for hallway chat or ad hoc briefings. The occasion provided an opportunity for me to present the first of four papers on museums and the Internet written with support from the Getty Trust and Canadian Heritage Information Network in 1995. In it I examined ways that museum information might be able to distinguish itself and acquire a foothold in content distribution. Lyn Elliot Sherwood's reflections on CHIN's findings from consultations with their members, who were seeking ways to make the Internet work for their institutions, provides further food for thought and planning. Other papers addressed more specific aspects of the challenge. The summary discussion raised numerous excellent points and displayed the considerable scope of the discussions that had taken place throughout the day.

* Linda McRae, "The Union List of Artists Names (A Review)," **Visual Resources Association Bulletin** 22:4 (Winter 1995), 37- 45.

This is as thorough a review of the new Getty authority publication, in both paper and electronic form, as anyone would want, and shows examples of how the database works. While generally favorable, Ms. McRae points out a number of shortcomings in the product.

Journals

* **Culture in Cyberspace**, a free journal available by email from Information Networking and Management Associates (William LeFurgy). Contact: wlefurgy@radix.net

In mid-February many of us received an invitation from William LeFurgy to subscribe to a new bi-weekly journal devoted to culture on the Internet. After the first issue, we received word from Mr. LeFurgy that an overwhelming 700 readers responded to his invitation and that in response to that level of enthusiasm he was going to make the journal a weekly. Soon, volume 1, number 2 arrived; and then number 3, also on time! Based on three four-page news reports, what can we say? Each issue consists of about a dozen blurbs written by the editor and accompanied by web addresses at which more information can be found. A table of contents precedes each issue, and while it is not terribly informative, the brevity of the issues makes it acceptable. The journal comes as an ASCII file, so it looks ugly and doesn't "do" anything, but the articles are reasonably timely and will be interesting to almost anyone in the culture business. Hopefully Mr. LeFurgy will keep it up the proof of the pudding will be in how many subscribers would be willing to pay. For now, its free.

* **Practical Archivist: Information and Ideas for Custodians of Small Archives** (quarterly, from Anne Cooke, 11 Hipwood St., North Sydney NSW 2060, Australian). AU$10 p.a. plus postage.

Now in its fourth year, this four-page newsletter contains the kind of miscellaneous information that is more valuable for making someone feel a part of a larger enterprise rather than for actually providing needed information on a timely basis. But then, feeling part of a larger enterprise is what small archives custodians almost always need.

* **Journal of the American Society for Information Science** 47:1 (January 1996).

In this special issue devoted to the evaluation of information retrieval systems, guest editor Jean Tague- Sutcliffe has drawn together eight important articles examining the history of information retrieval research over the past decade and the state of the art today. David Blair's assessment of the STAIRS evaluation after ten years makes clear the complexity of the questions that must be asked in retrieval research and why so little definitive progress has been made. Three articles on aspects of measurement, relevance assessment and purpose/task analysis in retrieval which follow are valuable contributions to the literature and build on prior

experience. I was particularly impressed by the report by F.W. Lancaster and his colleagues on the design of an evaluative framework for the AI support systems of MEDLARS and the report by M. Beaulieu, S. Robertson and E. Rasmussen on designing interactive elements into a large-scale evaluation project. Both exposed the work that must be done to remove assumptions about user behavior and isolate factors contributing to search effectiveness. Other articles in this issue relate to stemming algorithms and query performance measures. It is always somewhat amazing, in an electronic world utterly dependent on retrieval mechanisms, how little is actually known about what works and why, and how many decisions in practice rely on gut sense rather than empirical data.

Online

American Memory Project: End-user evaluation (http://lcweb2.loc.gov/usereval.html or ftp://ftp.loc.gov/pub/american.memory/user.eval).

From 1990 to 1995, the Library of Congress American Memory pilot project undertook the digitization of a variety of special collections from the Library to explore the technological, legal, economic, and societal issues raised by their distribution. From 1992 to 1994, the Library conducted detailed evaluations by users of a dozen CD-ROM and videodisk products created up to that date. University faculty and students, librarians, and members of the public were involved, and the study revealed a surprisingly high level of interest in secondary schools. Primary source materials fit well into the kinds of curricular reforms being introduced in secondary education and the mechanisms for distribution, both fixed media and eventually the World Wide Web were accessible to secondary students. The findings of these studies, particularly with respect to networked distribution, the potential of SGML, the types of intellectual property issues encountered and the selection of materials for digitization, helped shape the latest phase of the Library of Congress effort, now called the National Digital Library Program. These evaluation studies should also be basic resources for any similar digitization projects, both because their specific findings will prove of interest and because the methods employed can be modified in future assessments.

Ephemera & Miscellany

* Cultural Ministers Council, Heritage Collections Committee, **National Conservation and Preservation Policy for Movable Cultural Heritage** (September 1995).

The Australian Heritage Collections Committee and Conservation Working Party, bodies established under the auspices of the Cultural Ministers Council representing Commonwealth, state, territorial, and local governments in Australia, deliberated for two years before arriving at the policies outlined in this report. The framework is one of a distributed national collection, linked intellectually by an information network, supporting access to Australia's cultural heritage by its people and those abroad. The few high level policies outlined in this brief document were adopted by the Council of Ministers last fall to guide the development of a distributed collection. Other countries will probably find these policies equally attractive.

Circuit Court Ruling Upsets Copyright Balance

A ruling by the Sixth Circuit Court of Appeals on February 12 seems to me to have seriously misread the law and upset the balance of copyright. I expect it to be appealed, but if not overturned it will probably have serious consequences for publishers thinking about making material available in print. According to the *NCC Washington Update*, from which this report is taken, the Court of Appeals for the Sixth Circuit ruled in favor of the Michigan Document Center and against the plaintiffs -- Princeton University Press, Macmillan, and St. Martin's Press. The three presses had brought a copyright infringement case against the Michigan Document Service, which has five small copy shops that serve the University of Michigan and other institutions in the Ann Arbor area and which reproduces course packs without securing copyright permissions from the authors or publishers. James Smith, the owner of Michigan Documents Service, decided that the current process for obtaining permissions to reproduce copyrighted materials was prohibitively time-consuming and expensive. He thus prepared course packs for teachers and students without securing permissions operating on the basis that he was engaged in copying for educational purposes which comes under the fair-use provisions of the copyright law. The Appeals Court ruling reversed the decision of the District Court.

Circuit Judge J. Ryan's opinion asserted that while the copy shop is a commercial enterprise, the copying of course packs was for educational purposes and (completely misunderstanding the arguments about economic harm, I think) that since course packs are priced per-page based on copying costs regardless of the contents the copy shop is not making a commercial gain off of copyrighted materials. Further, he argued that since Congress specifically anticipated the use of "multiple copies" for classroom teaching, the copy center is making use of professional copying technologies to assist the professors and students in an activity which faculty and students are permitted to undertake but which they can not do as economically and efficiently as the copy center (also misunderstanding why "systematic" copying has heretofore been clearly prohibited). He also placed significant weight on the assertion that the professors made that they would not have assigned the original works if copied excerpts were not available to prove that students who used the course packs were not a market for the purchase of the original works.

Judge Ryan argued that the plaintiffs' reliance on the Classroom Guidelines established in 1976 by CONTU, the Commission on New Technological Uses of Copyrighted Works, "is misplaced." Instead, he proposed his own ruling (1) that classroom use of the course packs promotes learning without undue harm to the incentives to create original works; (2) that course packs are particularly helpful in interdisciplinary courses that draw small portions from a number of disciplines; and (3) that the record contains no evidence that the market for the original work was affected by the use of excerpts in course packs. In what strikes me as a completely irrelevant argument, Judge Ryan's ruling concluded with an additional consideration, that "more than one hundred authors declared on record that they write for professional and personal reasons such as making a contribution to the discipline, providing an opportunity for colleagues to evaluate and critique the authors' ideas and theories, enhancing the authors' professional reputation, and improving career opportunities. These declarants stated that their primary purpose in writing is not for monetary compensation and that they advocate wide dissemination of excerpts from their work via course packs without imposition of permission fees. The fact that incentives for producing higher education materials may not revolve around monetary compensation is highly relevant. Copyright law seeks to encourage the use of works to the greatest extent possible without creating undue disincentives to the creation of new works." Since the people in question had assigned their copyright to publishers, I can see no reason why their views of economic harm ought to prevail.

Hopefully the decision will be appealed before it does irrevocable damage to the copyright regime which I doubt would survive as a means of protecting intellectual property if such cavalier wholesale copying is allowed.

NEH Awards H-Net grant

The National Endowment for the Humanities awarded Humanities On-Line its fourth major grant in eighteen months to continue operating the fifty Internet daily newsletters which now serve over 30,000 subscribers from sixty-two countries. The grant will also permit creation of lists in new disciplines. All the lists are edited by teams of scholars and each message is approved by one of the 130 editors from ninety-nine institutions in the

US and eight other countries. The editors elect officers and an executive committee. Several of the lists have more than 1000 subscribers.

The NEH grant will also permit establishing a book review program which will enable H-Net to publish 100 full length reviews by scholars each month. The reviews will average three times the length permitted by paper journals and appear within weeks of publication rather than after the 18 month delay typical in print. In addition, the grant will enable H-Net lists to remain free of charge for one more year. For further information about H-Net write to Executive Director Richard Jensen at H-Net@uicvm.uic.edu or 615-552-9923.

MicroGallery opens at National Gallery of Art, Washington

On 17 October 1995 the National Gallery of Art opened a MicroGallery modeled after that at the National Gallery London. Like its counterpart, the MicroGallery was made possible by a grant from the American Express Corporation and was designed by Cognitive Applications. The installation differs somewhat from that in London the thirteen computers installed in an "Art Information Room" near the West Wing entrance do not have a local print out capability that is both popular and somewhat troublesome in London, but does provide a remote printer capability to allow visitors to print out personal tours and pick them up at the visitor information desk. Considerable attention was paid to the design of the space; twelve workstations are wheelchair accessible, one is designed for stand-up use, three will accommodate three or more people seated around the monitor, and nine will accommodate two people. In addition, many new features made possible by technological advances over the past three years were incorporated, such as touch-screen technology, more varied pathways, interactive zooms, and images with higher resolution. While the structure of the program reflects curatorial decisions specific to the NGA, and some of these differ from those in London, the clean and simply look and feel imposed by Cognitive Applications will be familiar to users acquainted with the earlier product; only the realization is more technically sophisticated.

STANDARDS

Standards Australia issues Records Management Standard

Australian Standard 4390.1-6.1996, published on 5 February, carries the almost improbable title "Records Management." Its six brief sections may be the best short course in the concept of archives and records management ever devised.

The preface states forthrightly what the standard is about:

> Organizations create and maintain records as evidence of business activities and transactions.
>
> Inadequate records and recordkeeping can contribute to, or even be instrumental in, accountability failure through
>
> (a) failure of employees or systems to make records in the first place;
>
> (b) making records that are inadequate to meet accountability and other organizational requirements (i.e., records that are not full and accurate);
>
> (c) failure to capture records into recordkeeping systems, so that they are subject to arbitrary destruction or cannot be found when required;
>
> (d) failure to identify and retrieve the authoritative version of a record where multiple versions exist;
>
> (e) failure to maintain records during the time necessary to meet specific accountability requirements; and
>
> (f) failure to assign responsibility for different aspects of recordkeeping at appropriate levels in the organization, so that no one takes responsibility.

The standard is a voluntary code of practice designed to provide guidelines and strategies which are built on a strong foundation. For example, the glossary defines *records* as "recorded information in any form, including data in computer systems, created or received and maintained by an organization or person in the transaction of business or the conduct of affairs and kept as evidence of such activity"; *recordkeeping systems* as "information systems which capture, maintain, and provide access to records over time"; and *recordkeeping* as "making and maintaining complete, accurate, reliable evidence of business transactions in the form of recorded information."

The standard is designed to help organizations avoid risks associated with poor recordkeeping, so it provides quite concrete guidance. For example, in the "General" standard, under strategies for monitoring and compliance it states:

> A compliant organization can demonstrate that
>
> (a) it has developed and implemented effective strategies to ensure that full and accurate records are made and captured into recordkeeping systems;
>
> (b) it has systematically and comprehensively identified the accountability requirements to which it and its employees are subject, and that it has procedures in place to track changes to these requirements;
>
> (c) it has identified the nature and extent of evidence necessary to meet each accountability requirement to which it is subject, and the risks associated with not having such evidence;
>
> (d) it has identified the recordkeeping requirements arising from all aspects of its accountability environment;
>
> (e) it has assigned responsibilities for meeting recordkeeping requirements to appropriate people in the organization;
>
> (f) it has integrated support for recordkeeping into policies, business rules, standard operating procedures, and the design of work processes and of information, business application, and communication systems;

> (g) recordkeeping procedures and practices are operating, which have been designed to ensure that records kept are full and accurate for specific purposes;
>
> (h) it has established and maintains one or more recordkeeping systems into which records are to be captured and maintained;
>
> (i) recordkeeping systems are designed and operated according to relevant best practice;
>
> (j) all its records are captured in those recordkeeping systems;
>
> (k) all records management systems are performance tested on a regular basis to ensure that the objectives of the system are being met.

Parts 2-6 of the standard apply to specific processes within records management:

> 4390.2 Responsibilities
> 4390.3 Strategies
> 4390.4 Control
> 4390.5 Appraisal and disposal
> 4390.6 Storage

The style of these sections follows that of the general standard. Each contains numerous fairly specific points which reference definitions, strategies, and methods for monitoring compliance. Occasionally there are appendixes with more detailed models (either "informative" or "normative") of specific processes. Typically the analysis, especially when presented as a series of points, can be very useful in structuring practice. For example, in 4390.2 (Responsibility), we read:

> **Records**. Organizations create and maintain records as evidence of business activities and transactions. This evidence, which comprises the corporate memory of the organization and its narrative history
>
> (a) supports policy formation and managerial decision-making;

(b) enables the organization to meet legislative and regulatory requirements;

(c) protects the interests of the organization and the rights of employees, clients, and citizens;

(d) supports better performance of business activity throughout the organization;

(e) provides protection and support in litigation, including better management of risks associated with the existence or lack of evidence of organizational activity;

(f) supports consistency, continuity, and productivity in management and administration;

(g) documents organizational activities, development and achievement; and

(h) supports research and development activities.

The strength of this series of standards, however, derives not from these higher level statements (even though their specificity is often welcome), but from the longest part of the standard (4390.3 - Strategies) which is at one and the same time the most narrative and the most specific. A taste of this specificity can be read in the first part of the body of the standard "for general application":

> **General**. In designing recordkeeping systems, organizations shall consider the legislative and regulatory environments in which they are operating. Requirements within standards and best practices which may need to be given timely consideration include the following:
>
> (a) The usability of the record: Is it legible, understandable, and re-presentable? Can it be connected to the business transaction which produced it? Can its authenticity be verified? Does it continue to provide an accurate representation of content? Is the record accessible to appropriate personnel? Is it retrievable?
>
> (b) The reliability of the recordkeeping system. Is the system capable of continuous and reliable operation in accordance with responsible strategies for implementation? If the system contains material converted from other systems, has appropriate information been brought forward?

Pursuing these issues in detail,. the standard fleshes out all the functional requirements for evidence identified in the University of Pittsburgh study and explores a variety of implementation concepts that will be valuable to anyone trying to put these standards into place in real systems. The discussion of "Cases", and particularly of "types of transactions (8.2)" should be sufficiently detailed to be of value to any organization. For example, in the common question of how to deal with drafts:

> 8.2.4 *Drafts and versions*. In some business processes, such as the development of policy, successive drafts of the same document must be retained to provide adequate evidence of the process. Whether this is necessary should be determined through the analysis of recordkeeping requirements, as discussed above, and should be documented in policy and procedures.
>
> Each successive draft in such a process is normally involved in a transaction. A draft may be submitted for approval (this is a transaction) and approved or rejected (another transaction); it may be circulated for comment (a transaction) and other people may provide comments (more transactions). Following a revision, it may be submitted or circulated again (a fresh transaction), and so on.
>
> In such cases, each version of the document should be captured as, or as part of, the record of the transaction in which it participates; i.e., the successive drafts may be versions of the same document, from the document management perspective, but they are different records from the recordkeeping perspective. They should be captured and maintained in the recordkeeping system as successive records of the matter.

These kinds of definitional statements become more important when the standard moves on to concrete contexts of their application. For

example, in discussing electronic recordkeeping systems, the standard makes a number of distinctions that I've rarely seen understood elsewhere:

> 8.4.1 *Electronic Mail.* The transmission of an electronic mail message is a transaction and the message is thus a record. Besides the content of electronic mail messages, contextual data, such as the name and position of sender and recipient, date and time of sending, copies sent to other people and links to replies and enclosed documents should be captured and maintained.
>
> 8.4.2 *Electronic Documents.* Electronic records are distinguished from electronic documents by their transactional context (they are created within business transactions) and evidential purpose (they are kept as evidence of that activity). Electronic documents are normally managed through data and document management software.
>
> An electronic document becomes an electronic record when it takes part in a business transaction, and is kept to provide evidence of that transaction. Thus a report prepared using a word processor remains a document until it is submitted, when it becomes a record. It may still be retained and used as a document, for example, as a basis for a new document. To function as a record, however, it must be captured into an electronic recordkeeping system and must incorporate relevant structural and contextual information, as well as content.

One of the major strengths of the standard is its explicit definition of records as products of transactions and the recognition this affords to the importance of their location within an organizational business process. For example, in the statement of scope for 4390.5 on appraisal and disposition, the standard reads:

> Appraisal is an analytical process which determines
>
> (a) which records should be captured into recordkeeping systems; and

> (b) how long such records should be maintained.
>
> Successful implementation of appraisal ensures that
>
> (i) requirements to create records for each business activity are identified;
>
> (ii) risks for non-compliance with recordkeeping requirements are defined;
>
> (iii) adequate records are captured in recordkeeping systems; (iv) records are retained;
>
> (v) records required over time are migrated between recordkeeping systems;
>
> (vi) records not required by each business activity are deleted or destroyed; and
>
> (vii) transfer of custody or ownership of records between organizations, where appropriate, is documented

As these overall objectives are carried down into more detailed implications, the directions in the standard become implementable, for example:

> 6.2 *Analysis*
>
> 6.2.1 Analyze the environment in which the organization operates. The organization must be placed in its broad legal and social context in order to determine which records of its activities need to be kept to comply with legal, business and community expectations.
>
> Analysis of the broad legal and social context identifies
>
> (a) the legal framework which impinges on its operations;
>
> (b) the internal and external stakeholders whose interests the organization must take into account; and
>
> (c) the business, social and ethical standards the community expects it to meet.

This section (6.2.1) then continues in detail to define specific pieces of information required and where they will be found. In the next section (6.2.2) the standard takes "identifying the business functions and

activities of the organization" down a similar path of intellectual decomposition:

> An analysis of business functions and activities focuses on
>
> (a) the goals and strategies of the organization;
>
> (b) the broad functions of the organization which supports the pursuit of these goals and strategies;
>
> (c) the activities of the organization which constitutes the function;
>
> (d) the groups of recurring transactions which constitute each activity. This analysis results in a business classification scheme.

This last point reflects one of the shortcomings of the otherwise excellent standard: in trying especially to make the case for these new approaches to more traditional records managers, it often does not translate between records management views and the perspective of information technology specialists who would have called this latter document a business process model and understood better what the analysis produced if the translation had been provided. More serious, sometimes, is when the translation would have given the message much greater weight and complexity, as in the discussion of "conversion" where the current document completely overlooks the knowledge representation that goes on in moving information out of one software dependent structure and into a new one with minimal damage. Nevertheless, this standard surpasses all other guidelines I've ever read in making the issues facing electronic records management clear to those with records management background and providing a detailed framework for best practices in managing records in any format.

STANDARDS NOTES

AIIM Launches "Reliability of Electronic Business Information" standard development

In late January 1996, the Association for Information and Image Management Standards Board approved a project entitled "Reliability of Electronic Business Information" (REBI) to be undertaken by Committee C22 co-ordinated by Dan Schneider (U.S.Department of Justice) and Kevin Vaugh (Harper Collins Publishers). The leadoff meeting of the group will be held on March 1. The purposes of the standard are

* to make official business activities between organizations and within organizations at least as reliable when conducted electronically as they would be with paper,
* to reduce the cost of electronic recordkeeping for such official business information by having commercial-off-the- shelf (COTS) products perform many recordkeeping functions, and
* to define interchange standards for official recordkeeping applicable to important contractual, property, and regulatory information.

The prospectus for the REBI standard notes that the basis of the standard will be defining the necessary metadata. The problem at the moment is that COTS hardware and software capture metadata in proprietary ways and therefore the burden of metadata recordkeeping falls on organizations of all kinds that are trying to conduct business electronically. The project will create a standard way of identifying and representing items of metadata and attaching them to electronic documents, transactions, messages, images, etc. The result is to be trustworthiness of electronic information without requiring software vendors to give up any of the proprietary advantages of their own systems. The sine qua non is that "it will be as possible to detect unauthorized changes to metadata as to the information it is describing."

The approach is essentially that taken in my draft Reference Model for Business Acceptable Communications and in the work of the University of Pittsburgh project on functional requirements for evidence in recordkeeping. I look forward to seeing how it progresses.

Categories for Description of Works of Art

The Getty Art History Information Program released "Categories for the Description of Works of Art," a putative standards product that has had a long gestation. Initially drafted by the Art Information Task Force sponsored by the Getty and the College Art Association and funded by the NEH, I believe the Categories describe the point-of-view of art historians towards art information and as such articulate the knowledge representation requirements of a specific user community. More discussion of their relationship to other data models and their implications for information systems are published in a series of background papers on the issues raised by the Categories in a special issue of the journal Visual Resources (11:3-4).

Over the years there has been a great deal of confusion about what the Categories are and how they should be used. The orthodox view is summarized now on the fly-sheet of the package containing the diskettes which states:

"Categories for the Description of Works of Art is a product of the Art Information Task Force (AITF) which sought to encourage dialogue between art historians and information providers so that together they could develop guidelines for describing works of art that reflected scholarly research needs.

"The Categories not only define the information that descriptions of works of art should include but also identify common vocabulary resources and descriptive practices that will make art information more uniform and therefore more accessible.

"The Categories are a framework to which existing art information systems can be mapped and upon which new systems can be developed.

"AHIP anticipates that the Categories will provide a common ground for reaching agreement on what information will be shared with others or will be included in automated descriptions of works of art."

Encoding Standards for Electronic Finding Aids

Two years ago the library at the University of California at Berkeley received funding from the Department of Education to explore a standard for electronic finding aids. Their work led them to adopt SGML as an approach to markup and analyze a sample of finding aids to define a possible DTD. In March 1995 they shared the DTD with archivists and manuscript librarians invited to a conference in California and in July they took the DTD to a week-long workshop of experts in archival description standards and SGML experts at the University of Michigan Bentley Historical Library Research Fellowship Program. The result of that meeting was adoption of a set of principles (designated the Ann Arbor Accords) which guided the revision of the DTD. The principles narrowed the target scope to inventories and registers and the target use to creation of new finding aids or conversion of existing ones from paper or electronic formats with functionality to support "description, control, navigation, indexing, and online and print presentation."

The DTD was to have two main segments: a *header* which contains information about the finding aid, and the *body of the finding aid*, which may contain hierarchically organized information that describes units of records and adjunct information that may not directly describe records or papers but can facilitate their use by a researcher. This framework enabled the team to identify elements that could be tagged at predictable points in a description (descriptive elements) and those which could be tagged anywhere in the document (generic elements). In general the group decided to employ Text Encoding Initiative (TEI) guidelines where the tags existed within TEI. In addition, the team decided to take full advantage of the ability within SGML to associate attributes with elements in order to make them more specific allowing a smaller group of elements to be expanded by attributes rather than creating a larger set of specific elements. The DTD does not prescribe content, it merely establishes a language for content designation. As such it is intended to facilitate interchange.

The revised data model and DTD which emerged from the meeting has been named the Encoded Archival description (EAD) and published in a draft form for adoption as a standard. The results of this work were recently published in *Archival Outlook* (January 1996, pp.10-13) The complete standard will also contain a second part consisting of "extensive examples of encoded finding aids." Although not yet identified, the principles also note that the "control and maintenance of the DTD will be provided by a national institution working in concert with national and international archival communities."

As a critic of the physicality and lack of framework in the initial Berkeley Finding Aids DTD, I am impressed by the progress reflected in the Ann Arbor Accords and the new EAD.

While much testing should be done in the near term, especially around the adequacy of the EAD as a framework for retrieval and control, the proposal is a serious one with a good fit into standards strategies in the scholarly and museum communities.

Network Scripting Languages

Netscape Communications Corporation and Sun Microsystems, Inc., released an open, cross-platform object scripting language (JavaScript) in December 1995 to support customization of applications on the WWW. The beta version of Netscape Navigator 2.0, which can be downloaded from the Netscape Web site, contains the initial release of JavaScript. Final specifications were submitted to industry standards bodies and the Internet Engineering Task Force (IETF) in January with backing from many of the largest companies in the inter-networking field. The point of the language is to enable people without programming experience to construct relatively complex applications as well as to allow programmers to create aplets. A variety of other tools and resources are being developed, some free and others under license, for making client/server applications and browsing Java-built environments. Java has been licensed to IBM, Oracle, Silicon Graphics, Microsoft, and many other large companies which expect to implement it rapidly in a broad array of products.

Microsoft almost simultaneously announced that it would be making Visual Basic Script available over the Internet at no cost. Like JavaScript, this object-linking and embedding language allows developers to link Web pages and automate interactions. However it is not being advanced as an open standard. Microsoft has proposed Active VRML, its 3-D animation language, for adoption as an open industry specification however, and it shares many of the features of the other two scripting languages, although designed principally for interactive multimedia rather than Internet applications.

Records and Archives Competency Standards

Australian records managers and archivists have become "registered" players in a movement driven by unions, employers, and government in Australia to establish competency standards for all branches of work in order to guide education, training, and professional practice. Specifically such standards are intended to assess competencies of individual workers, provide a framework for accrediting education and training programs, and establish a basis for cross-crediting work experience and academic training. The Records and Archives Competency Standards Working Group, officially recognized under this regime, is comprised of government, union, employer, and professional (Australian Council of Archives and the Australian Society of Archivists) representatives. The group is currently awaiting funding and recently presented the rationale for its work to the ASA (which published it in the *ASA Bulletin*, October 1995).

I found that rationale very exciting and the discussion presented to ASA members exceptionally thoughtful. The Working Group recognized that if archivists and records managers didn't become involved in establishing competency standards for themselves, someone else would and the result would either be an inappropriate definition or the field would be subsumed under some other professional titles. They recognized, of course, that the danger of becoming involved included continued absence of shared views among archivists and records managers, the challenge of defining a relationship between recordkeeping and information professionals, and the emphasis in competency standards on training over education, and skills and techniques over knowledge. On the other hand, they felt the opportunities to explore best practices and roles, demarcate recordkeeping, and promote better training were real and that individuals within the profession would benefit by development of assessment criteria, improved career paths, and enhancement of job satisfaction especially for more clerical and administrative functions. They also felt that competency standards would form a basis for higher quality vocational and continuing education and have an indirect but positive impact.

The members of the Working Group introduced the concepts behind competency standards at a workshop at last year's ASA conference and presented a draft framework developed by Anne Picot and Barbara Reed for comment. The framework identified five principal tasks: organizational analysis, appraisal, documentation, access, and monitoring. Skills were identified for each task; for organizational analysis these were:

* Analyzing and documenting of functions and activities,
* Determining to what interested parties the organization is answerable,
* Researching appropriate industry standards and practices with which the

organization ought to comply, and

* Analyzing acceptable risks of non-compliance in recordkeeping for a particular industry/organization.

Performance criteria, the range of responsibility of the archivist, and evidence (or skills and knowledge) were then identified.

The draft document, which is under continued development, is available from Sue McKemmish, Department of Librarianship, Archives and Records, Monash University, Clayton VIC 3168, Australia.

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Richard Light is a freelance SGML and museum information systems consultant. He worked on data standards and museum software for the Museum Documentation Association from 1977 to 1991, during which time he co-chaired CIDOC's Committee on Reconciliation of Data Standards. As well as advising CIMI on SGML issues, he is helping the National Museum of American Art's Publications and New Media Department to re- engineer its operations around SGML. He is currently Treasurer of the International SGML Users' Group.

Paul Evan Peters is the executive director of the Coalition for Networked Information. Immediately before founding the Coalition in March 1990, Mr. Peters was Systems Coordinator at the New York Public Library from 1987 through 1989. Before that he was Assistant University Librarian for Systems at Columbia University, where he also earned a masters degree in sociology. From 1970 until 1978, Mr. Peters was a principal in a variety of research and development projects and he earned a masters degree in library and information science at the University of Pittsburgh.

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