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Designing Museum Websites For Collection Records

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Who might use museums collection records online?

Consider the following users and their interest in online museum records:

A curator is working on an exhibition of American decorative arts. To create a historical context for the exhibition, he plans to borrow portraits from other museums to display with decorative art objects. In an effort to economize and save time, he would like to search online for appropriate works before visiting other cultural institutions. Using the National Portrait Gallery database available through the website of the Smithsonian Institution (http: www.si.org) he finds hundreds of possible choices from museums spanning the country. However, only a fraction of the online collection records show images of the portraits. None of the records offer descriptions of the portraits. In the curator's opinion, the online database was not a complete resource. Should online databases function as scholarly resources?

A high school teacher hoped to improve her lesson on late twentieth century art in America. The school has neither a slide collection nor funds for publications. She found no books on the subject in the school library. Since there were also no funds available for a field trip to a museum, it occurred to her to send the students directly to the website of Museum of Modern Art (http://www.moma.org). This would give her class an opportunity to discover art directly. She heard from a friend that the website contained audio narratives summarizing several masterpieces in the collection. She thought the multimedia and images would inspire the class to find out more about late twentieth century art. The teacher planned to give the students a list of stylistic art movements and assign a short research project. Upon inspection of the Museum of Modern Art website, the teacher discovered that there are no thematic classifications used to organize the online collection records. The website groups the collection by curatorial

departments such as painting and sculpture, drawing, prints, and photography. An introductory page for each department shows ten images with no text describing the images. The same layout repeats on each subsequent page thus creating page after page of small pictures of artwork. There are neither chronological references nor groupings of major art movements such as "post modern art," "conceptual art" or "minimalism." Visitors must select each image individually to reveal the artist's name, the work's title, and creation date. To discover more background information the visitor must wait for 30-60 seconds to load an audio clip. There is no connecting thread to link styles of art together other than medium. The teacher realized, to her dismay, that her students would have to sort manually through a large quantity of images. She concluded that the teenagers would not be able to identify late twentieth century works by sight alone. She feared they would become frustrated, and abandoned her idea. How should museums educate and engage website visitors?

A group of Native Americans believe that a university museum has not been complying with the Native American Graves and Repatriation Act (NAGPRA, enacted in the United States in 1990[1]). The group suspects the federally funded museum is not entirely forthcoming in revealing to them the scope of the university's Native American collection. Under NAGPRA, lineal descendants or persons with cultural affiliation to Native American tribes [defined in 43 CFR 10.14(c)] are entitled to request repatriation of human remains, funerary objects, sacred objects, and objects of cultural patrimony. Due to both health and economic reasons, representatives of the group are unable to travel directly to the university to inspect the collection. They demand access to the collection database online to scrutinize the collection for objects covered under NAGPRA. The database however, does not fully document the collection. Numerous artifacts lack attribution to specific tribes or geographic areas. Very few objects are

photographed and those that are unfortunately are not displayed in the database. What obligation does the museum have to provide public access to collection records? What legal issues now challenge or will ultimately lead to the online publication of museum collection records?

Visitors to museums are multigenerational and ethnically diverse. Can a museum website sustain such a broad audience? Not everyone who visits the website may be interested in viewing the entirety of the collection records. The majority of visitors might only want to see pictures of the collection highlights. Designing and implementing a collection database and a website is an expensive ongoing project. Obviously, before a museum goes through the effort of making its collection available online it should devise an overall plan. To begin, designers of museum websites should answer one basic question: Who are the potential users of their collection records? Clearly, a primary school age user will have a different skill level than a scholar. Designing websites for collection records with the user in mind directs museums in the selection of content, style, and mechanics of navigation. Website visitors with an educational interest will want a thorough resource. However, interacting with the collection in the manner of an online encyclopedia may be perfect for one user but boring for another. In most cases, varying degrees of interaction will be appropriate.

In designing museum websites to publish collection records institutions should realize the entire process before they begin. Just as any major project, design should follow a planned task oriented process. As in planning exhibitions and print publications, museums must address technical, conceptual, and legal issues. Everyone involved in the project should know why the organization is placing records online.

This thesis examines museum websites incorporating object collection records. It explores several website design strategies used by different organizations to guide online visitors

through collection records. Section I of this paper identifies the components of a website and the process of authoring content material. It discusses database efficiency and the fragility of electronic records as the primary means of online communication. Section II examines designing collection records for the potential user. It traces both the technical and conceptual approaches to designing museum websites for collection records. Section III deals with several legal issues effecting websites including copyright and licensing.

The web medium is still new and many museums are just beginning to embark on their first projects. How can they streamline their in-house network to ease the transition to the Internet? Detailed reports and summaries of many museum web projects are readily available through the Museum Computer Network and several publications. However, no conclusive surveys of museum website design exist. Much of the literature seems to be written for information technology professionals, library resource technicians, or well informed insiders who already possess graduate level knowledge of electronic records management. Consequently, the job of running the museum website is left to people who know little about museums. Although museum website designs are getting better every year, many are still deficient. In general, the content of collection object records needs to be developed. Participation from curators, collection managers, registrars, and educators is equally important in website development as it is in exhibitions. Relevant website design for museum collection records depends on input from a team of staffers who recognize the public's interest in museum objects.

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[1] McKeown, C. Timothy, Murphy, Amanda, and Schansberg, Jennifer. 1998. In *The New Museum Registration Methods,* ed. Rebecca A. Buck and Jean Allman Gilmore, 17-42. Washington DC: American Association of Museums. p. 311

INTRODUCTION

Connecting with the User

My first encounter with an interactive kiosk in a museum setting was probably in 1994 when I went with a group of Cub Scouts to the Statute of Liberty and Ellis Island. At the time, a series of kiosks sat adjacent to the main exhibition area of the Ellis Island Immigration Museum. Most of the kids in our group rushed to them immediately like moths to a flame. The kiosks looked like the computerized terminals you would find in a typical library. There were no graphics, fancy typefaces, or pictures. The only appealing thing about them was the fact that we could type on the keyboard. The monitors had start-up screens with a solid color background and light color letters. The screen featured a form that allowed the user to enter a name. My son and I did not even stop to determine what the purpose of the kiosk was before we entered our last name, "Pifko," into the computer. The keyboard responded that no matches were found. We tried again this time entering my maiden name "Harding." We got a hit this time! It was then that I realized the kiosk was a guide to the "Wall of Honor," a commemorative monument on Ellis Island. The "Wall of Honor" is a large wall outside the main building with many panels; each is engraved with the names of immigrants whose descendants have generously made naming donations. Unbeknownst to me at the time was the fact that my aunt had made such a donation. When I entered my maiden name, which is more common than my married name, I expected that some names would come up. I never expected a hit that revealed the name of my great-great grandfather, George Harding, who emigrated from England to the United States in 1852. I knew this George Harding was my relative because the retrieved record revealed the name of my father's sister from Columbus, Ohio who submitted it. Needless to say we were not only pleasantly surprised to find the hit, my son and I now had a new purpose. We now had to find the "Wall of Honor" panel on which George

Harding's name was engraved. We also searched every other family name that I could remember and the names of our closest friends.

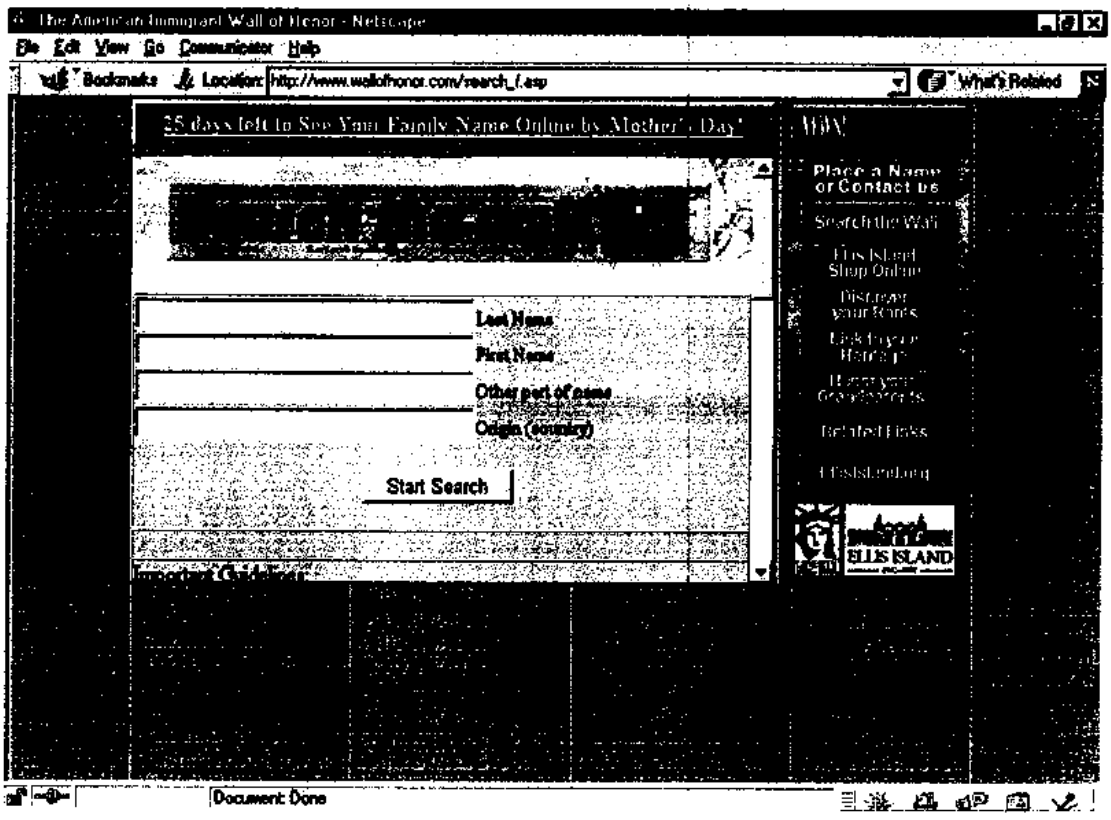

Figure 1. The Search Form on the Ellis Island Website for the "Wall of Honor"

Now seven years later the same information is available online at the Ellis Island website. New names have been added. My married name now produces two hits. But I have no information to connect my husband's family to the "Pifkos" I discovered in my online search. But that may soon change. Up until now what was available online was the guide to the "Wall of Honor," which is in essence one of the Ellis Island Museum's collection objects. Found on the Ellis Island website, the information is not an object record like a traditional record. It does not tell a visitor about the physical attributes of the object itself. It does, however, anticipate the user's interest in the object. The basic search form allows users to enter their name. Both the kiosk and the web site designers decided that visitors' interest in the "Wall of Honor" pertains to the names engraved on it. Visitors want to know what names are on the wall and how to find them.

On April 20, 2001, the long awaited *The American Family History Center* opened at Ellis Island. The center, designed by Edwin Schlossberg, is home to another ambitious project, a national genealogy archive. The project's goal is to make tracing family genealogy possible for over 40 percent of Americans.[1] Now anyone will be able (for a fee) to research their personal heritage through a new genealogy database called *The Arrival Records Database,* which is accessible by kiosks and online. It will permit visitors to search records pertaining to more than 17 million immigrants who arrived in New York between 1892-1924.[2] Volunteers from the Church of Latter Day Saints have entered the records into the database.[3] The database will retrieve the following information: "immigrant's given name, immigrant's surname, ship name, port of origin, arrival date, line number on manifest, gender, age, marital status, nationality, last residence (town & country)."[4] The search engine is set up to retrieve close matches and phonetic spellings of immigrants' names.[5] Visitors will now be able to search the manifests of ships and copy those records. *The Arrival Records Database* will enable users to print out both records and photos. Ultimately, it will include immigration information presented in multimedia formats. The website invites Americans to contribute objects, records, and personal information to *The American Family History Center* so that they may be digitized for the database.[6]

The Arrival Records Database aspires to provide access to the vast collection of the Ellis Island Immigration Museum documents, a collection that is perhaps better described as an archive. As a basic example of online collection record, it is unique. It retrieves information contained in collection objects (such as the ship manifests) not data regarding the physical attributes and history of the objects. Since 1982 when the Statue of Liberty - Ellis Island Foundation came into being its primary mission has been to provide public access to the Ellis Island Immigration Records. Although the museum does have display cases filled with objects, the value of the collection lies in the information written in the historical documents rather than the documents themselves. As a

representation of a museum collection, *The Arrival Records Database* itself has become a new entity. In a digital environment like a kiosk, CD-ROM, or the Internet a museum object is subject to new physical characteristics. The user now interacts with not a collection object but a collection record.

Although the database is not fully functional yet, users are eager to use it. Gaining online access to *The Arrival Records Database* is extremely difficult due to the high demand. Since it launched online, in April 2001, it has been so flooded with hits that some visitors can not log on to use it, proving that people want to research their own personal history. They want to log on because the website is relevant to their lives.

What the *Arrival Records Database* will ultimately be as an online multimedia digital entity remains to be seen. But in its current state the site effectively acknowledges the user and takes a step toward fulfilling the foundation's mission. Visitors are quickly able to connect themselves to Ellis Island, an unfamiliar historical place with a familiar personal attribute, their family name. The user becomes engaged by a personal connection to the collection.

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[1] Hajela, Deepti. 12 November 1998. "Ellis Island Immigration Museum to Offer Database for Quick Tracking of Relatives." Star Tribune (Minneapolis, MN): 4E.

[2] "Your Family History Will Come Alive at the American Family Immigration History Center." Retrieved 23 February 2001. *American Family Immigration History Center, Ellis Island.* http://www.ellisisland.org/history.html.

[3] Hajela, Deepti. 12 November 1998. "Ellis Island Immigration Museum to Offer Database for Quick Tracking of Relatives."Star Tribune (Minneapolis, MN), 12 November: 4E.

[4] "Your Family History Will Come Alive at the American Family Immigration History Center." Retrieved 23 February 2001 *American Family Immigration History Center, Ellis Island.* http://www.ellisisland.org/history.html.

[5] Ibid.

[6] Ibid.

SECTION I

Understanding Websites, Databases, & Electronic Collection Records

Both a website and collection record can be many things. In a museum, different staff members maintain different kinds of records and photographs to document objects. The curator retains object research and catalog files. A museum educator keeps records that relate objects to interpretive programs or school curriculums. A registrar maintains the records of transactions including: insurance, title, shipping, and storage information. They are all users of the collection records. Today much of this information can be affordably created or converted into a digital format. By doing so, the information can now be shared online in networks and published on websites. Collection records are now any information about a museum object that is accessible via a computer network or website, including digital images, text, sound recordings, and video clips.

Electronic records can assume diverse forms yet they recur from the same basic binary building block. Everything on website is composed of simple binary code. It is the electronic code, which generates text, images, sounds, video, and animation.

Online collection records provide convenient access to information regarding museum objects. Networked collection records permit staff members to input information as well as output reports from the central system. When records are stored centrally on a Central Processing Unit (CPU or server) a resource is created for staff. Within the network, the CPU stores common files for easy in-house access.

Externally, however, the practical use of museum object records might not be as obvious. Understanding the non-staff uses of museum networks requires a closer look at the practical use of websites. David Miller,[7] suggests several possible uses for websites:

- to provide information
- to gather information

- for educational purposes
- for communication
- for public relations
- for customer support
- for sales
- for internal communications

If we apply these functions of websites to those designed for museum collection records, we can begin to identify several practical applications for records online. Many museum websites will inadvertently fulfill most of these uses simultaneously. For instance, the website is yet another venue for publication and promotion of the museum's objects. By creating primary electronic records and publishing them online, museums build credentials for their collection objects and the museum itself.

Several conceptual and technical issues will need to be confronted by museums before focusing on creating primary content material. First, it is critical to understand the nature of website design. It is not the same as print design or exhibition design, nor is it as versatile as film or video. The medium has both capabilities and limitations. It has its own dynamics and tools. But like other forms of media, it requires a sophisticated design that merges technology, information, and aesthetics.

Components of a Web Page

There are two basic components needed to create a web page: language and a software tool, to interpret that language.

HTML- HyperText Markup Language

Web pages are written in HTML code. It is a coded language that governs how a browser will display web page content. It tells the browser where to find the content files and where to put those files on the screen. Several other derivative languages and scripts can be coded into the HTML to add dynamics and multimedia to a web page.

Browser - a software tool

A browser is computer software such as Netscape Navigator and Internet Explorer that communicates with internet servers to request and gather information online. It displays the retrieved code on the user's screen.

Each component of a website is built with digital code. Therefore, anything that we want to put online must be in a digital format to be published online. Text, graphics, and some animation attributes can be written directly into the HTML code but images, sound, and video files must be stored and retrieved by the browser. Websites can be customized with a vast array of file types and mini-programs. Applets and scripts written into the HTML code tell the browser to animate a web page. Directions defined in the HTML code direct the browser where to go to find the stored files to display on the web page. The code includes instructions for hyper-linking segments of the page together. Every file must be in a digital format to be called up by a web browser.

Figure 2. An example of a Dallas Museum of Art web page that is not able to retrieve a digital image for display.

The preceding image (Figure 2) is an example of how digital images can be represented online if the HTML code does not clearly specify their stored location to the browser. In this case there is probably nothing wrong with the digital image, the problem is that Netscape Navigator could not find the file that holds the image. This is not a web design problem but a web master problem. A web page is written in code. The technician who coded this page made an error in the code line that specified the location of the image. The browser must read the code and the location embedded to retrieve images, database, and multimedia files. The appearance of a broken square on web pages means the code specifying location of the picture is incorrect or that something is preventing the browser from communicating with the place where the images are stored (the server).

Every component of a database or a web page must be machine readable and easy to store. Images, sound, and video components can occupy valuable storage space and cause web pages to load slowly. Very large multimedia, video, or high-resolution images can take from several minutes up to hours to download and open. Still there is more to it than that. As demonstrated by the broken image on the website of Dallas Museum of Art, the location of images have to be clearly defined for the browser (e.g. Netscape Navigator or Internet Explorer) to retrieve files.

The Process of Website Design

In non-art-making endeavors, the design process is dictated by a simple credo - form follows function. The same is true for website design. The purpose of the website is the primary determination of its form. Placing museum collection records online as a goal in and of itself serves no specific purpose. By having clearly defined goals, an institution can use internet technology and hypermedia to achieve many new and exciting objectives.

Just as any museum exhibition or program aspires to extend the mission of the institution,

a web project should be approached from the same angle. Website design should begin with an examination of the museum's mission in terms of the collection and the potential user audience.

Museums planning to publish collection records online should first consider how such a publication will fulfill their mission and who it will serve. The structure and content of the site should be designed after the primary goal is determined. Who would want to have access to the museum's collection records? To whom does the museum want to provide access? This is perhaps one of the most difficult questions for a museum to answer. Potential audience groups on the internet can be very broad and sites without security restrictions are open to anyone who dials up. Specific user groups can be targeted through various means. In light of the expense of going online with a critical mass of collection records it makes sense to identify potential user groups and anticipate how they would want to interact with the available website content.

In this context, the term 'content' refers to informational material selected and authored by the museum for online publication. Content can be very limited or extremely in-depth. One museum may decide to feature just certain highlights of a current exhibition while another might want every object in their collection accessible online. A basic record might include a digital image and catalog information such as the title of the object, maker, date of creation, medium, credit line, and accession number. Internet technology enables it to include much more. In addition to video and sound files, an object record could employ cross-reference links to investigate any number of relationships that exist between it and other objects or perhaps even cultures. The possibilities for hyper-linking are vast, conceivably endless. The interactive capability of the internet facilitates communication. By incorporating input forms a website becomes a vehicle to gather information as well as to provide it. Therefore, a website can be designed as a tool for both the user and the museum itself.

The term 'content' also refers to the way in which the information displayed on a website appears and behaves. A navigation system delivers content material to the user. Will the site

depend upon a search engine to find collection records or will it combine navigation strategies to convey information to the user? The graphics and animation of the website play an active role in navigation. By first organizing appropriate content material and then devising a navigation scheme, information will flow smoothly to the user.

"Technology is not content,"[8] is a well-known fact to experienced website designers. It is a tool used to deliver content material. Again, the user must be considered when selecting technology for the website. Here, demographics can be a very useful mechanism to implement an appropriate design for a target audience. Initially it seems like a great idea to provide high-resolution images, video, and other streaming media via the internet however, the user audience may not have the capability to take full advantage of the site's offerings. The demographics for different potential groups should reveal what kind of hardware they have access to. The average PC home user might only have a 14" monitor with 640 x 480 pixels and 16 colors, too small to display sites designed on larger monitors. The web page display will appear cropped. Some images and information may be lost. The latest plug-ins can be incorporated to create dazzling websites and play streaming media, but will users become baffled or irritated when they have to take time to access another site to down load a plug-in? Will visitors be disappointed or frustrated about having to reboot the computer to re-access the web page? Many website visitors have very little memory on their PCs. Their computers will crash if they enter a site that streams large files, they will not be able to handle or be willing to wait for long downloads. University subscribers often provide students with better equipment than the average home system, high school or elementary school. They have fast cable internet access but is the average college computer lab sound equipped? Providing options for users is good practice for website design but too many options can be overkill. Before making a substantial investment into site development museums need to take into account the technological capabilities of their potential user.

The aesthetic aspect of website design manifests itself in the interface. The term 'interface' can be defined in different ways, some very technical. Here, 'interface' refers to the elements of the computer and website that interact with the user (see Glossary). Interface design can also be thought of in terms as the user's experience of interacting with the site. Jack Davis and Susan Merritt[9] point out, "One of the most effective ways of communicating is to use the familiar to explain the unfamiliar. And one way to do that is with a *metaphor*- a figure of speech, or an entire constructed environment, in which one thing is spoken of or represented as if it were another." They use the example of designing a web page to look like pages in a book, hence the familiar book, with the unfamiliar web page. A popular metaphor for a museum website might be to design pages after the gallery floor plan. Several sites use a timeline or a map as a metaphor. Even without using a metaphor, the site still needs a tone, an attitude, or personality. The look of the layout, lettering, graphics, and color combine to create a style. It almost goes without saying that style has tremendous impact on the user. The way in which primary content is presented may be as equally important as the content itself. After all, if people are not engaged by their initial impression of the site will they explore it further? An attractive aesthetic and user-friendly navigational system will directly affect the success of the site.

The Homepage of *Frick Collection* (Figure 3) uses a picture frame as a metaphor. On subsequent pages however, the site alters the design. It still maintains the photographic depiction of the museum's interior but the overall graphic elements of the page have changed. When a visitor selects "Virtual Tour" (Figure 4.) the picture frame is absent. This particular transition of pages demonstrates that on the internet sometimes less graphics and in this case less metaphor communicate more information. The Frick's transition to a gallery floor plan metaphor is not only visually attractive but it is easier to understand.

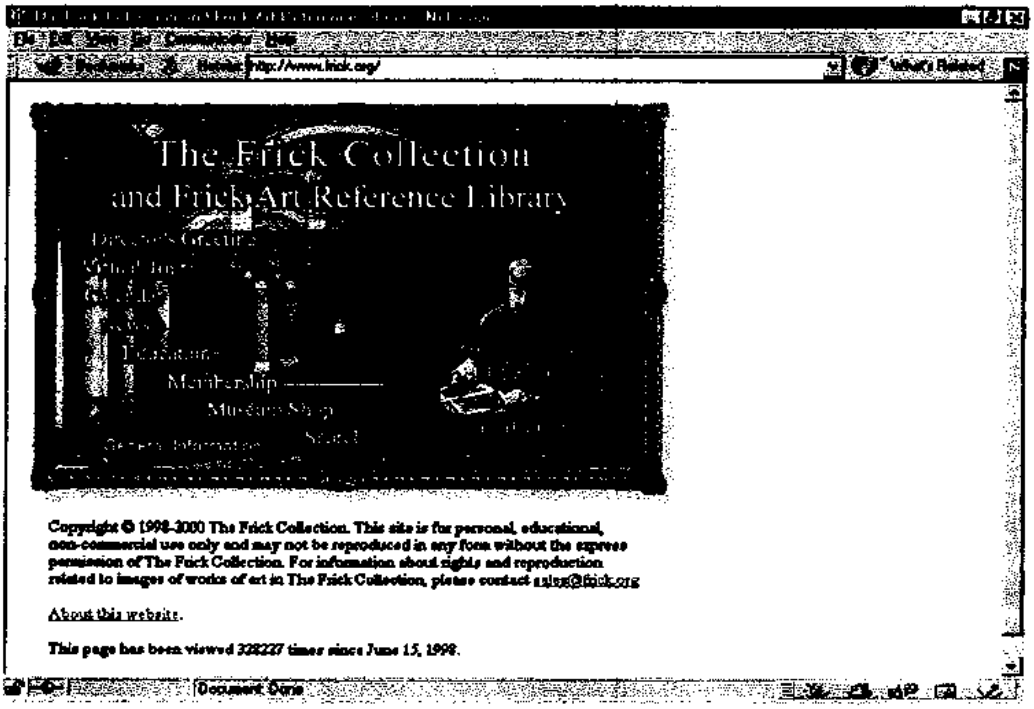

Figure 3. The Homepage of the Frick Collection uses a picture frame metaphor.

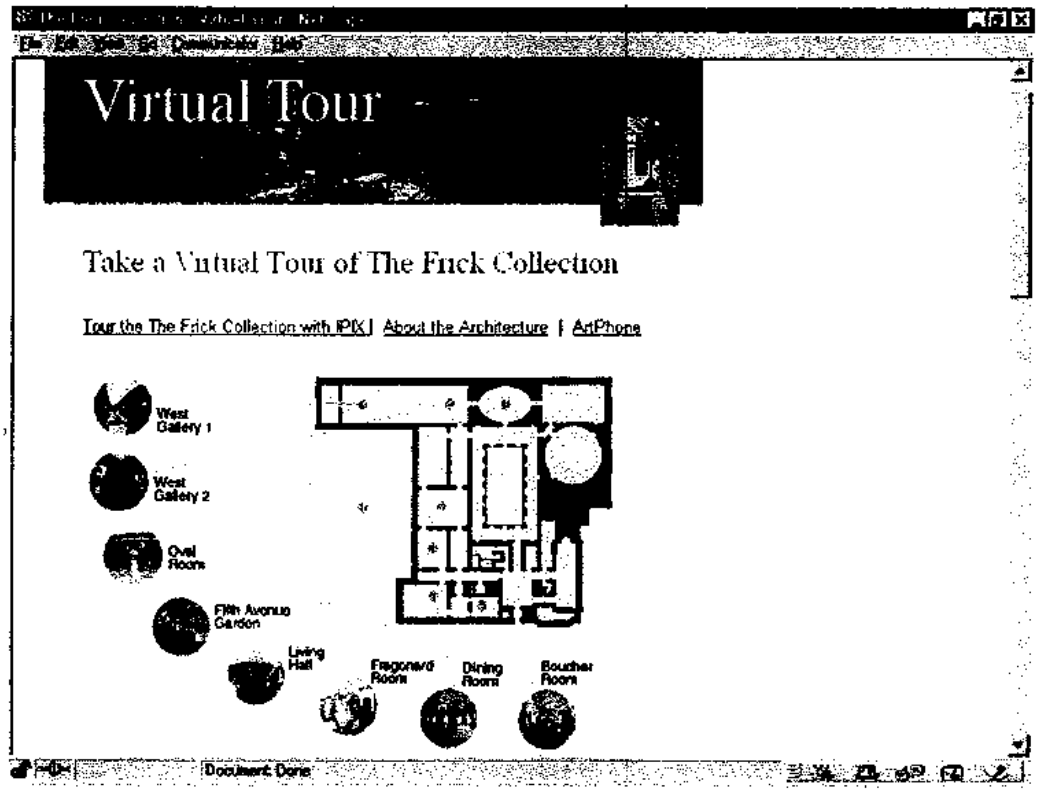

Figure 4. This Virtual Tour page of the Frick Collection uses a floor plan metaphor.

The metaphor chosen for the overall lay out and the graphics of the site can make the visitor feel comfortable visiting it. A style that carries over from page to page helps to make

internet visitors aware that they are still in the site they originally entered. It is very easy for web surfers to get lost online and wind up in sites that are far removed from their original destination. By providing a visual thread visitors remain conscious of where they are. *The American Advertising Museum* website design metaphor, (Figure 5) projects a style and a personality that keeps visitors on track. The metaphor used in this site is specific to the collection, because it echoes the nature of the collection itself. The graphic elements are reminiscent of an advertisement. The woman's profile against black background is used on every page. Visitors immediately know when they have left the site. However, on a very large site with hundreds of links and a database visitors might get bored with an image of this type.

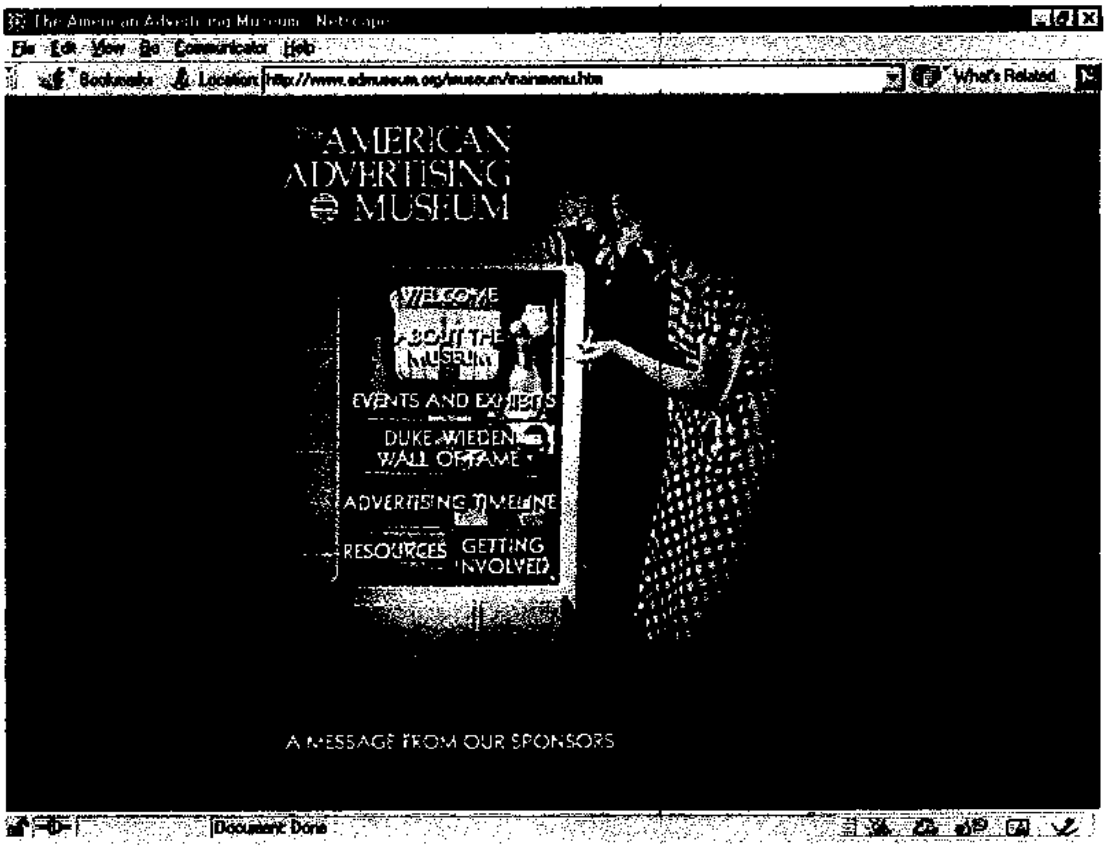

Figure 5. This Homepage of the American Advertising Museum is a collection specific metaphor.

Subtle layouts adorned with header graphics and side menus allow plenty of room for text, and collection records to be displayed. The Museum Computer Network recognized The

Metropolitan Museum in New York with its top website design award at the 2000 Muse Awards. The site uses the same basic layout on almost every page. Each major department is presented with a slightly different background color on the website.

The Metropolitan's site uses a design template and pre-selected style sheets to maintain a harmonious look for the entire site. The homepage layout incorporates the same side and top design elements, each page uses the same font and size of typeface, and each page has the M logo in the upper right corner. The images of artwork are consistently sized on the pages and allow the user to click on them to enlarge their size. The Metropolitan's visual consistency extends to the diverse facets of the site and is not limited to the collection records portion.

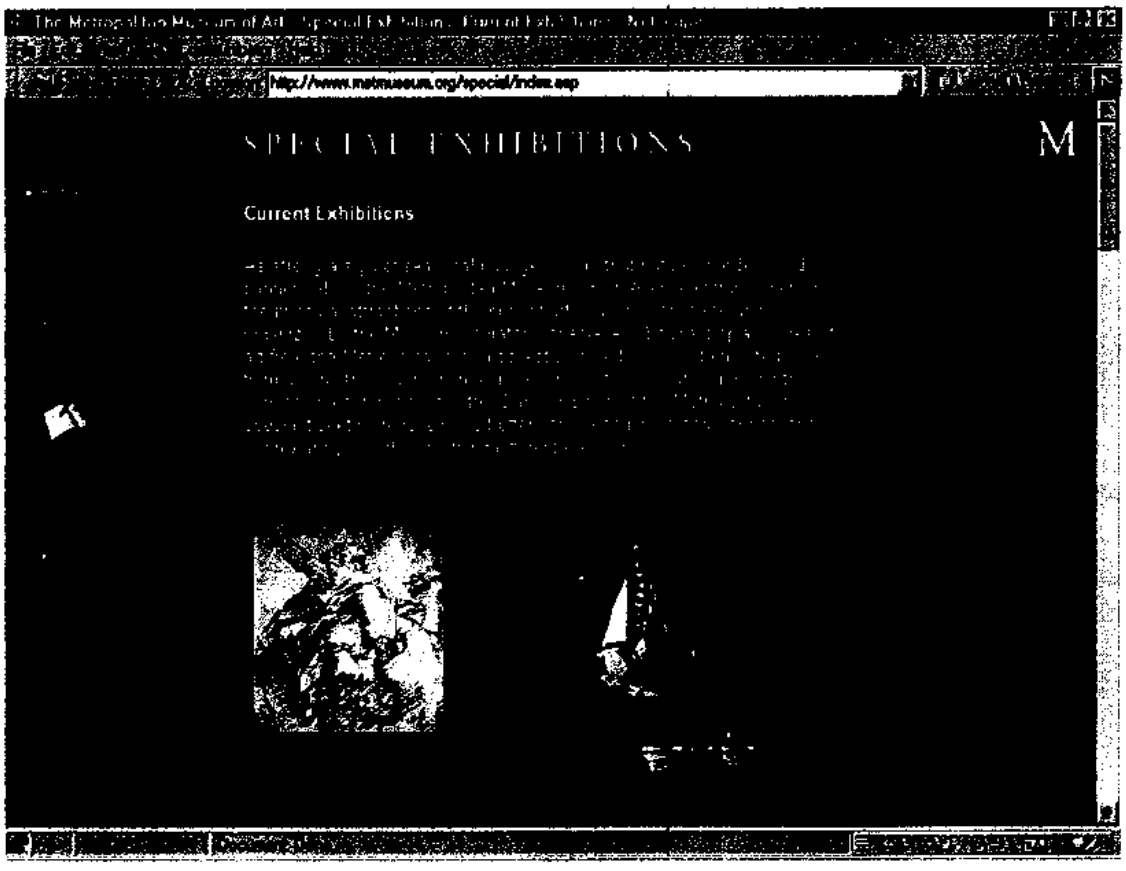

Figure 6. This Special Exhibitions page of the Metropolitan Museum in New York.

Typology is another essential component of hyper-media design. It functions as a website map that plans locations and routes within the site. Many sites allow the user to view the document map. The map is more than a table of contents, it lays out the page sequence, it plans the way in which the site behaves, sets forth the navigation options, and the hyperlinks. There are several options to consider when planning the pathways through the website. Pathways can be shallow or deep.[10] A deep nested design would direct the user in a linear sequence and build up layers of information. A shallow design would enable the user to follow their own path through the web pages. A shallow design has few controlled sequential trails. Options for a user's entry into collection records could be permitted thorough a series of consecutive pages or through a search engine.

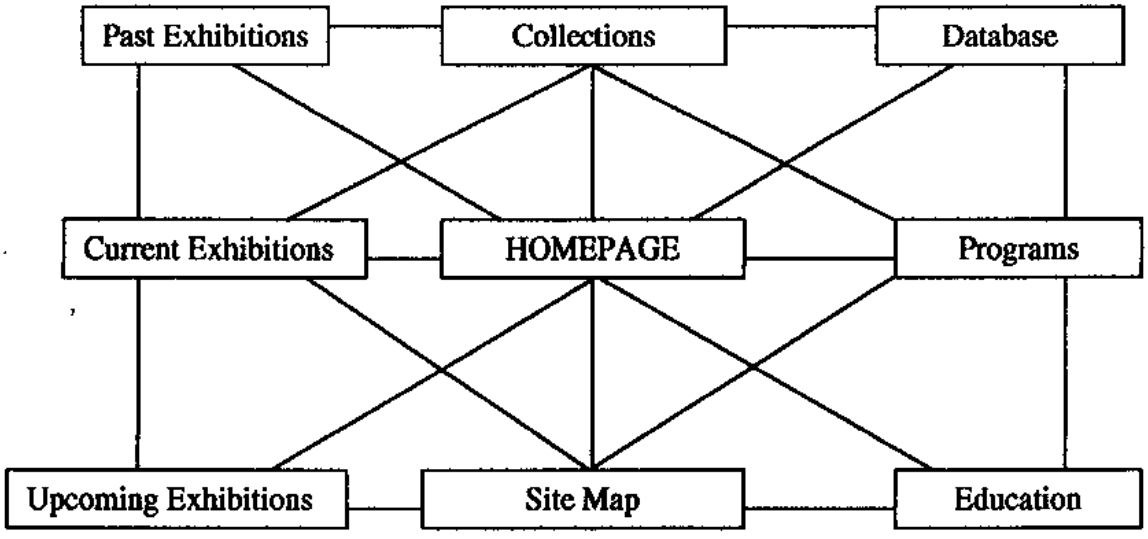

Figure 7. Typology example of a shallow website.[11]
Each page hyperlinks to several others

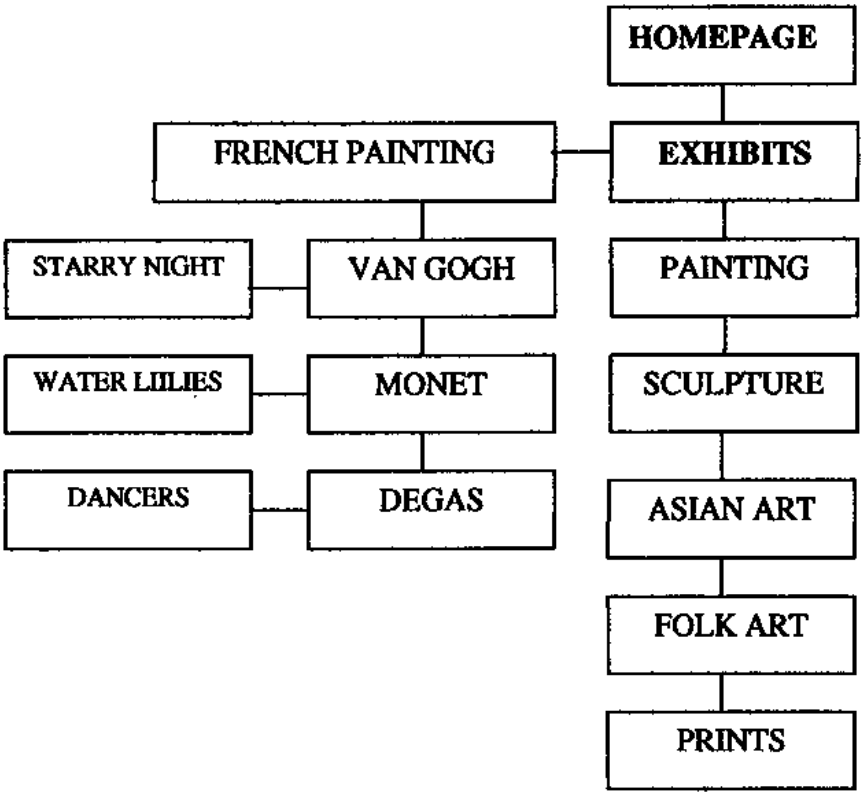

Figure 8. Typology example of a deep website[12]
The design is sequential, each web page hyperlinks to only one or two others.

A shallow design can easily become fragmented if the user is not controlled in some way. Every user will skip about in their own random pattern, a firm underlying structure needs to connect the fragmented parts together. Most sites combine shallow and deep design styles. The shallow design usually dominates the opening pages. Deeply nested design patterns for websites can trap visitors in a virtual labyrinth and consequently frustrate them. A site can still offer extensive information and a variety of file types in a deep pathway design if it comes equipped with exit links for the user who has had enough. Without deep nested pathways, however, information can not be sequential and build in a linear direction. Streaming content material, such as video, animation, and sound move in linear directions. In a web environment, linear movement is best kept in short concise bursts. That is not to say that deeply nested designs or

video have no place on the internet, quite the opposite, where else can people easily access the wealth of media archived from all over the world. On a web page, however, long playing files should have warnings for visitors so that they may chose to invest their time if they so desire. Instructions for the user are a prerequisite for long linear applications.

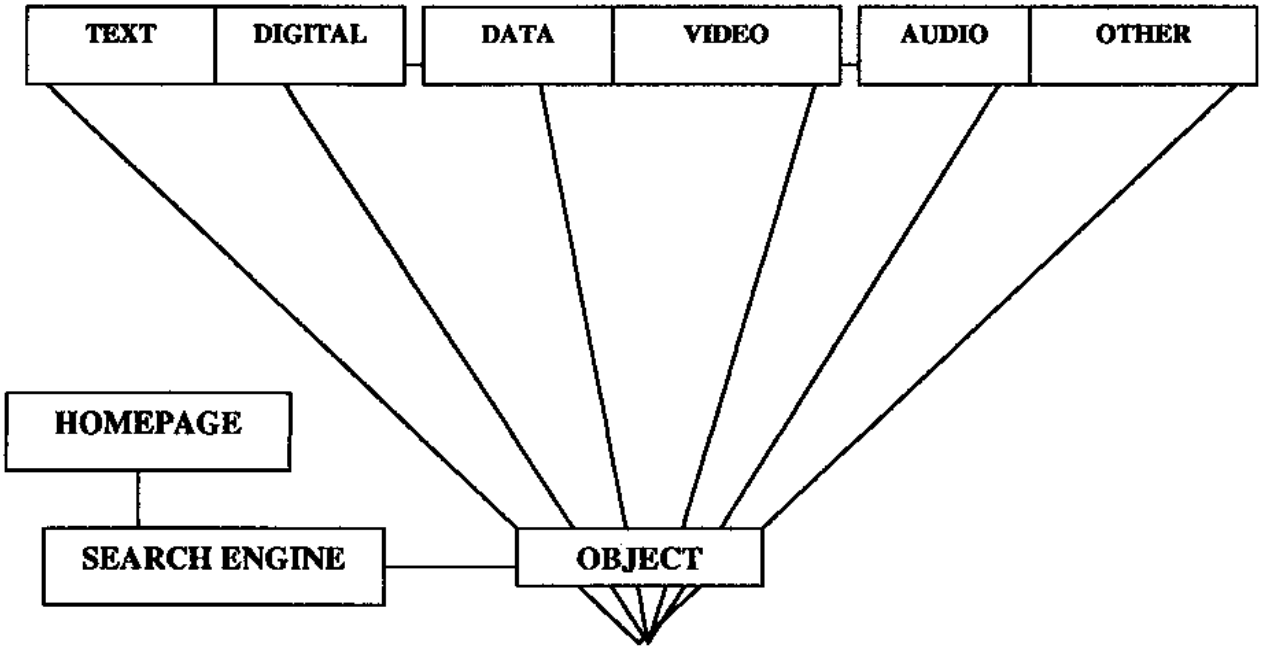

Figure 9. Typology of a database record[13]

Many sites have a database incorporated into the design typology to manage a large quantity of collection records. In a database, typology commonly uses search engines as an entry point. A database search engine allows the user to find the records in a non-sequential way. The same sites might then provide additional navigation options for users who want a directed path. Random browsing, if allowed in a database, is usually governed by categories or the alphabet.

Another kind of typology uses applications, applets, and scripts to create event driven environments. Here the website appears to be animated. The user might pass the mouse over an area of the screen, and an image appears. When the mouse is moved away, the image disappears. Event driven environments increase the interactivity of a site and engage the user.

The idea is that if a user performs action "A," the site will respond with action "B." Events should be designated as necessary or peripheral actions. If the event must happen to navigate through the site, written instructions should also be provided for the user. Typology controls how users navigate through the site and how the site will behave .

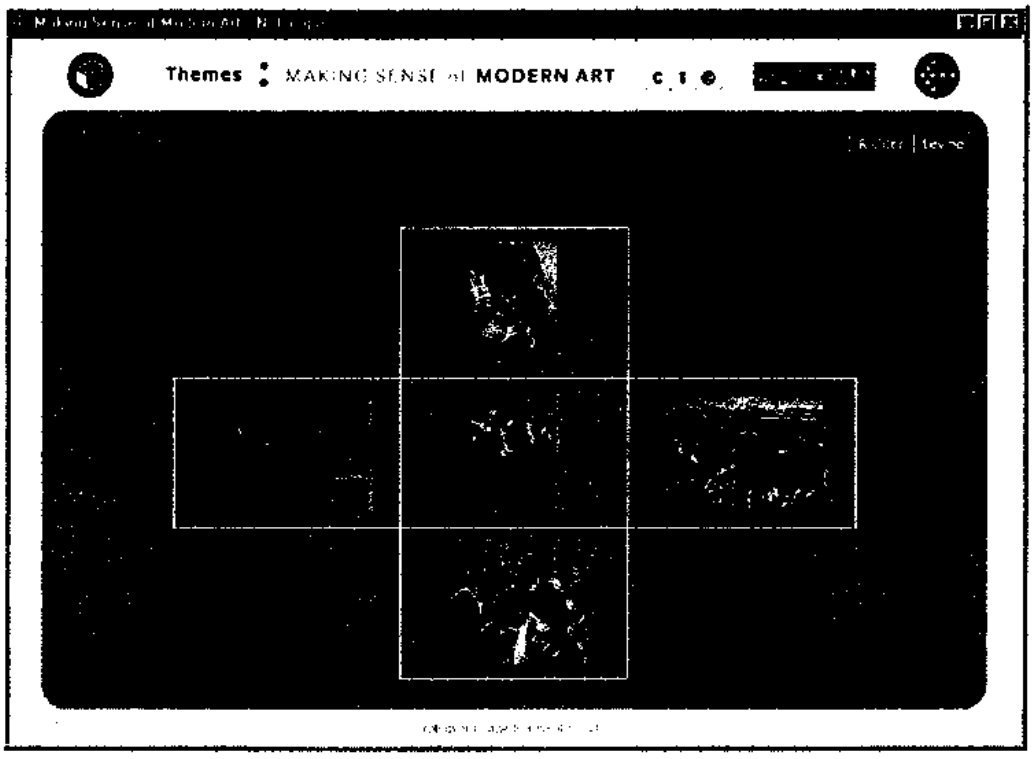

Figure 10. Typology example of an event driven environment.[14]

This page from the San Francisco Museum of Modern Art (Figure 10) uses an event driven environment. The command at the bottom of the screen tells the user to "roll over an image to reveal content."[15] When the user passes the mouse over an image the text changes to reveal each painting's title, medium, date of creation, and size.

Other design mechanisms used in hypermedia to link together data fragments are content driven designs and menu driven designs. Both provide non sequential access to data. Content driven design incorporates hyperlinks within the displayed text and images. Hyperlinks are

usually accented by graphic attributes such as color or underlined test. Menu driven navigation allows the user to select from a series of choices. Typical options include forward and back buttons or drop down menus.

The design process consists of several additional phases of creating, revising, and implementing the website following the steps just discussed. They include story boarding, generating a model site, technical steps involving data integration, and coding, as well as testing and evaluating the prototype. With the possible exception of the testing and evaluation phases, most of these tasks would be best left to a web master. Working groups comprised of museum curators, educators, and registrars need to have a firm concept established for the final site. However, their main task is to develop the primary content for the collection records that will be published online. To develop a sense of what websites do, museum working groups need to have an understanding of hyper-media. The web master can advise staff on design strategies but web masters are not museum experts. It is not the web master's job to author primary content material for the site.

Primary Content

Robert Yamashita,[16] developed a list he refers to as "Primary Content Production Phases" They are concise steps realized by museum participants in the Museum Site Licensing Project and defined as follows:

Selection of Objects	Refers to the museum collection objects selected by the museum to be included in the site.
Rights Clearance	Refers to the legal license to create digital images of collection objects and to distribute those images via the internet.
Digitalization	Refers to the process of creating digital images and files of museum collection objects. The process could simply involve photographing objects with a digital camera or

	encompass several steps to transfer existing analog images into a digital form.
Image Data Conversion	Refers to the specifications required to merge digital images into the existing database or software for web distribution.
Documentation	Refers to the transferring of the content provider's current digital data into the "proposed data dictionary and file exchange specifications.
Text Data Conversion	Refers to meeting required specifications to merge text files into the existing database or software for web distribution.
Error Correction	A self-explanatory phase. Refers to correcting errors in both content and format.
Object Transfer	The physical sending of a set of digital images and an accompanying delimited file consisting of the text documentation.

As a general guide for the process of physically producing primary content the steps are clear and to the point. The Nationals Digital Library Program (NDLP) also publishes a guide online entitled *Project Planning Checklist,*[17] which is extremely in-depth. The checklist lays out the process and tasks involved in digitizing collections. Both documents introduce easy to follow steps to understand what the process involves and how to prepare for the task. Neither guide however, offers any tutelage for the authoring of that digital content. They tell the reader how to digitize but they do not tell what to digitize. Section II of this thesis discusses issues and strategies for authoring content of collection records' for museum websites.

Databases as Primary Content for Websites

The collection database is a tool for collection management and documentation. It is also a vehicle to load records on to a network and the web. The design and implementation of a collections database is a lengthy process not only requiring an extensive investment in hardware,

software, and labor but also requiring an everlasting commitment to guarantee its success. Databases enable collections information to be explored and scrutinized in ways that were in the past cumbersome or impossible. Those unacquainted with database technology may believe that its implementation is a one time task and investment. Over the past two decades, museum journals have published several articles recanting tales of computer projects abandoned and ambitious prototypes never realized. Lenore Saranson,[18] explains several instances in which poor planning and lack of funds have left many costly database projects incomplete around the globe. Phil Phillips, head of information systems at the National Museum and Gallery on Merseyside, Liverpool, United Kingdom, put the problem in perspective when he said, "There is a danger in having too big and grandiose an objective that it never gets done."[19] This statement has never been more true than when it was published in 1995. Both in-house database and website projects can be destined for failure by having over zealous plans.

Internet technology has been evolving rapidly and consequently, our idea of how collection records should function has evolved as well. A database is a tool to publish records online and share information with like databases. The unique capabilities of databases have transformed collection records into interpretive tools. While less funded museums are still struggling to computerize basic catalog records, wealthier institutions have embarked upon exciting interactive internet projects. Ambitious projects facilitated by civic partnerships are now making the dream of the 24-hour museum a reality. Several nations have invested in linking together their cultural institutions to bridge this digital divide. Traditional museum goals of education and public access now shift to new dimensions by incorporating database technology.

Databases exist to be used. Networks simplify access. Within a typical collecting institution separate workstations throughout the building allow the simultaneous use of the database by several individuals. Every workstation is linked to the central processing unit (CPU or server) to form a local area network (called a LAN or intranet). The server stores several

programs for the database. The database administrator assigns each user privileges. Who will need to access the database and what permissions will they be granted? Not everyone cleared to use the database may have the same permissions to access the information stored in the database. Some users may have 'read only' access. Passwords function as keys to unlock entrances throughout the Intranet. The assignment of workstations and privileges must be clearly thought out in addition to the privileges granted to users. Relational databases can link together multiple records by a single field such as accession number.[20] The accession number, for example may link together a catalog record, a digital image, a conservation record, a location file, etc. The database administrator can allow a particular user, like the registrar, permission to access every relational file, while privileges may be limited for other users. Access to location and conservation files may be denied to educators. Does a museum with off site storage or satellite exhibition spaces need to connect their database to every location? Does a large museum like the Metropolitan Museum of Art need to have their distinct collections documented in one central database? Does the New York Guggenheim's database need to be linked to its affiliate museums in Germany, Italy, and Spain? For the day to day operation of the museum, wide area networks (WAN) such as the aforementioned are costly and unnecessary. Curators and publication staff may want to peruse the collection records of other affiliate museums and departments to expand their pool of works for exhibition and publication but is it worth the cost?

The database itself is an electronic entity made up of online files. If an institution has designed an in-house networked database, they have created an online collection of records. When they designed it, they in all likelihood discussed the layout and conventions for data entry with the staff members who would be using it. Their input is just as important when designing for the non-staff user. Just as each staff member has different uses for the collections database so will each potential user of a database available on the internet. To publish collection records on

a museum website the in-house database would be culled. Records selected for the website would be stored on a separate server.

Designing a Network Database

The collections database is a tremendous resource that is capable of retrieving requested data. The primary incentive for creating a database is to retrieve information quickly. Databases constructed using standard forms and vocabulary may be searched in any number of ways. For it to work properly it must be created properly. Database efficiency is contingent upon its initial specifications.

There are several excellent publications and guides available in both print and electronic format to help museums to automate collection records. These guides provide step-by-step instructions for planning, designing, implementing, and maintaining a fully functional database. They outline several essential phases in the automation process beginning with an analytical internal assessment and design phase. This stage is key to the ability of the database to retrieve accurate information. John Perkins,[21] urges museums to first establish an "Informatics Master Plan," then build an "Information Systems Framework," and "Information Technology Policy." These catch phrases may intimidate techno-phobic museum staff, however, in abridged form Perkins' basic components: a plan, a framework, and a policy, provide constructive guidelines.

A database designed for museum staff in all likelihood would never be available to non-staff members. It would be culled and edited before becoming accessible to online users. Unlike an in-house database designed for staff, a database designed for non-staff users might function much like the library card catalog. The collection's curatorial records would be available for exploration to scholars or students. Students could navigate the collection by field queries. Pertinent information contained in typical card catalog record format combined with a digital image is appropriate. Additional curatorial fields, like comparanda, provenance, and exhibition

history that specify the object's relevance to museum's collection and historical significance may not be typical in the average collection management database. In designing websites for collection records which fields of data should be included for an educationally focused website? That would depend upon the subject being taught. Which fields of data should be included if an institution wants to create an online reference tool that fully documents their collection. A complete reference could include information spanning from title and artist fields to those containing the dimensions of the object and its original appraised value. A museum may want to build an archive by including every object they own in the online database. In doing so will they reveal flaws in their documentation. Vast amounts of records in the museum's collection database might not be sufficiently complete. Financial considerations aside there are other issues. Users become frustrated if they spend time searching records only to find them incomplete. Blank records reflect badly on the museum. In-house databases require editing for web publication, in fact they require authoring.

An online collection database is a publication. As a basic tool for collection publication the database approach can be easily implemented through most collection database programs. For example, Argus Open Edition™ software (a relational database program) uses in-house networks (local area networks or intranets) to provide access to many users. Each collection object file is made up of several records each containing fields. An object file links together records for potential staff users such as: catalog records, provenance records, digital image records, appraisal records, conservation records, condition reports, exhibition history, credit lines, location, label copy, rights and licensing records, cross reference records, etc. All of these records contain specific fields of data. The Argus Open Edition Web Module™ enables the online publication of the entire database if desired. But more practically, the software permits searching and editing of the database before publication on the web.

Argus Open Edition™ uses an optional Cold Fusion™ web module (software installed on the server). The module is available for any "ODBC-compliant database"[22] (Open Database Connectivity, see Glossary). Other collection management software packages have modules similar to the Argus Open Edition version. The module runs on the same server as the web server. It uses SQL (Structured Query Language) and can be accessed with a web browser.[23] A Cold Fusion™ web module can be used on both a local area network (LAN) and a wide area network (WAN). Therefore, it would be capable of being used solely in-house as a kiosk complimenting an exhibit in the gallery.

The Argus Web Module allows queries based on search criteria. Random browsing is impractical with mass quantities of records. Therefore, the data entry phase of record creation is crucial to the usability of the database. Establishing a framework for object files and standard ways of entering information make the database an effective reference tool. Good practice in database construction depends upon the consistent use of lexicons, preset vocabularies, thesauri, and reference tools. The control of data is so important in databases that some museums may only permit selected people to enter information. It is desirable to control field length and vocabulary. Some database programs incorporate control mechanisms as tools. Fields of data may need to be designated as well (for example as text, numeric, dates, or monetary). Argus Open Edition™ restricts data entry by only permitting the entry of lexicon terms in specified data fields. It further controls data entry in selected fields by only accepting data conforming to specific syntaxes (displayed in drop down menus or alert boxes) as defined by the administrator. Other programs commonly permit the administrator to impose other limits like the number of characters allowed in data fields. However, the program can only do so much. The responsibility for regulating data lies with the people authoring the information or those in charge of data entry. The Argus lexicon tree allows administrators to establish a hierarchy of terms identified as parent and child terms. A parent term, for example would be "The United States of America", and a

child term would be "California". As a parent term, "California" would rank above "Los Angeles." When a lexicon is properly used, a query in the Geographic Location field requesting The "United States of America" would retrieve child terms as well, in this case every "California" and "Los Angeles" entry.

The same lexicon hierarchy should be set up to retrieve abbreviations. "United States of America" should list "USA" as a child term. The lexicon hierarchy extends to terms entered in it. "Ceramics" could be a parent term for "terracotta" and variations or pseudonyms in artist's names as in the case of photographer "WeeGee" (Arthur Fellig) may be preset in the lexicon. As a search tool, the lexicon not only expand the usability of the in-house database if authored properly it can greatly expands the usability of the web module. Most users may not know an artist's full name or they may not refer to a field with the exact term used by the cataloguer. In theory, the lexicon increases the usability of a database exponentially. The benefit of authoring the lexicon could play a tremendous role in the database's interpretive power but it may be easily overlooked when museums are struggling to just enter the basic skeleton of records into the database.

Authoring Standardization

When databases extend to LANs (local area networks) and the web they take on new roles. Databases now fill multiple purposes for education, public access, exhibition, and entertainment. No matter what the purpose of the database, to function as an effective retrieval system the data contained within the system must conform to a framework and employ common datasets. Successful Information System Planning requires the uses of uniform standards and dictionaries.[24] Different people commonly author and enter data into a central database. Standards for data entry are essential to enable cross-departmental records to merge into one centralized collection management tool. For separate institutions to merge their collection records to create an online resource of object records, standards facilitate cross-tabulation and

cross-domain access of heterogeneous records. A database functions on the same basic principle as anything else - organization, procedure, and storage. Classifications systems and documentation procedures need to be established and maintained. For example, if all digital images included in a database employ the GIF file format (a small image file) they will fit into the program. High-Resolutions images like JPEGs (a image file larger than a GIF) generate better quality images. On one hand, a GIF loads quickly but sacrifices image quality. On the other hand, a JPEG takes longer to load and uses more memory. Placing JPEGS on every web page slows a website considerably. On some occasions a museum may wish to publish a high-resolution image on the web page and would require a larger JPEG digital image. Rather than placing the JPEG on a homepage a better choice would be to insert a hyperlink to the image within the website. Simple decisions regarding file formats will have long term impact. The creation and formatting of data will determine its portability across hardware or software platforms. It is best to select a consistent flexible format that may be adapted as technology changes. Many experts recommend that TIFF or PDF file formats be used as source file for digital images because they can be easily converted for a variety of applications.

Procedures to create content files for internet use pertain to every kind of data that is to be stored in the database: images, sound, video, and text. Text is one of the most difficult things to control in a database. Consistent spelling, punctuation, and proper terminology guarantee successful information retrieval. Creating electronic records for thousands of objects accessioned decades ago may require editing the original accession cards for entry into the collection management database. For example, an object called a "vase" on a 1925 record may now be called a "vessel" in the database. The same database might refer to the "object name" as: vessel and the "title" of the object as: "vase."

Reference tools such as the Getty Art and Architecture Thesaurus, the Getty Thesaurus of Geographical Names, the United List of Artists Names (ULAN), etc., are available to standardize

data entry vocabulary. Most of these references are available on the web and as reference books. The Getty's leadership in establishing industry standards reaches beyond museums to the art community as a whole. The FBI is now using one of their electronic tools.[25] "ObjectID" creates a unique dossier for every work of art included in it. James Bower, head of Institutional Relations for the Getty Institute praises how the database brings together law enforcement and accurate documentation.[26] The precise description of artwork is essential to recover stolen works. Other databases such as the Art Loss Database and the Getty Provenance Index, are reference tools to help the international art community identify specific objects.

Various authorities and standards for information systems address terminology, organization structure, and data management. The references serve as guides to define scholarly art information not necessarily collection management information. One kind of authoring tool, *ICONCLASS* helps categorize art images by subject. It uses a numbered hierarchical order to divide subject matter into 10 topics. The three components of *ICONCLASS* include a classification system, an index, and a bibliography.[27] Used together as a tool, *ICONCLASS* teaches catalogers a numeric shorthand to describe complex images. For example, the code "42DD25" represents a painting described as a "wedding feast, wedding meal; out of doors." The resulting description is so cryptic that only scholars equipped with the *ICONCLASS* code book would be able to decipher it. It is not a tool for collection management. In the museum where interns and registrars perform data entry, such scholarly references seem impractical.

The Art Information Task Force is one of several organizations working to develop tools for art documentation, including *Categories for the Description of Art* similar to *ICONCLASS* in purpose. Beginning in 1987, the Art Institute of Chicago used *Categories for the Description of Art History* when they undertook a recataloging of the collection of drawings. About one half the 10,500 drawings had never been previously cataloged.[28] The framework provided by the

AITF and the Getty References tools were instrumental in facilitating the realization of the project's goals. Another task force initiative, *AITF SGML DTD,* provides technical mapping standards for sharing information online. To accomplish mapping, the software tool searches for common factors of an existing database to find a level for data interchange between two databases.

The *Dublin Core* was one of the first attempts to develop universal metadata categories for online sharing of art information. It created standardized classification structures for museum collections. Its primary aim, to synthesize information gathered from miscellaneous museum staff into one central database, relied on indexing functions to categorize information. The *Dublin Core* system depends on ordering collection information into clearly defined universal categories to share data between departments and institutions. The categories serve to identify or tag database information. These identifying tags are called metadata. The *Dublin Core* categorizes objects by group and labels with machine-readable metatags. Most collection management software incorporates metadata to sort information. Creators of the *Dublin Core* still work to perfect metadata and other indexing software tools.

Reference tools however may not be applicable to unique collections. To solve this problem most museum software packages allow adaptation and the creation of supplemental in-house data dictionaries to catalog unique collections accurately, as demonstrated by the Royal Air Force Museum, Hendon, United Kingdom. They determined that *SPECTRUM* (a system of museum object documentation used widely in the United Kingdom) is not enough to accommodate the needs of this aviation museum and is only partially used.[29] To accomplish their information retrieval needs the Royal Air Force Museum required a customized database application and unique authoring tools. A "terminology working group" authored a thesaurus and dictionary for their collection of aircraft.[30] The physical nature of their aircraft collection requires various components of the same object to be stored separately, sometimes housed in

locations geographically many miles apart. The database must be accessible at each different location to manage the collection effectively. The customized program also incorporates color digital images and digital sound used in exhibitions as well.[31] Unique collections and documentation methods impose more challenges to online information sharing.

Electronic Records

The very nature of a database record is fragmented. Descriptive words used to identify object predetermine what we will learn about them. If we equate the database to the questionnaires that a person might fill out during the course of their lifetime a simple observation becomes glaringly clear. The text fragments that describe a person... place of birth, height, weight, health history, credit history, academic record, employment history, even a computer dating questionnaire of likes and dislikes... combined do not give a accurate representation of a person. If we add sound recordings of the person's voice, perhaps a testimonial or an oral history, then add a video clip, do we now have a better representation? Even when these components are added up we may never know that our hypothetical person inherited their red hair from their mother's father or that they have a small mole on the back of their neck. But is that important? What does it take to construct an accurate portrayal? People and objects are very different. I use this example to illustrate a point. I am not attempting to compare them to each other, I am stating that describing anything through a framework of fielded data is unsubtle. Each descriptive category condenses the object. The entire process fragments information. Using a database to represent an object, as a series of classifications dissects it. Documenting an object this way can never substitute for the original; it is not necessarily an accurate representation of the original. Database documentation is a tool to categorize the object, not to represent it. By breaking down a description of an object to a series of categories the object is reconstructed in

the digital environment. Each separate user of the collection information is now capable of isolating and retrieving the information they desire. Large quantities of records can be explored quickly.

The ever-expanding uses for collection databases create additional responsibilities for collections personnel. Wealthy institutions are going far beyond the average museum in meeting the challenges. Partnerships between museums, governments, and other supporters are enabling cutting edge internet projects to flourish. But how can the average museum keep pace? Should they even try? Whether or not a collecting institution sees itself as a participant in this trend, it should not be inhibiting itself from establishing a solid foundation for its own collections database.

Neil Beagrie of the Arts and Humanities Data Service, London clarified the situation, "How data is created and its form will impinge directly upon how it can be managed, used, retained and preserved at any future date. All or most of these criteria will also determine collections' usefulness" as a resource to "funding agencies ..."[32] The Archaeological Data Service (ADS) based at the University of York (United Kingdom) runs an internet directory linking to other organizations. In the United Kingdom, groups funding cultural institutions strongly recommend conformity to the ADS datasets.[33] Even a small museum should begin with standards. The internal network should be sure to take security precautions. Research by The Humanities Advanced Technology and Information at Glasgow University recommended that cultural institutions create a core of electronic records to document their collections. They also stress that it is essential to create the core before proceeding with any interactive or internet projects.

Digital data is inherently short lived. Museum professionals may find their computerized records in magnetic format to be one of the most fragile objects in the collection. A New York State database created in the 1970s listing toxic waste sites is already disintegrating.[34] NASA

records from the 60's and 70's have suffered losses attributed to "heat, flooding and aging," costing $500,000 in restoration fees.[35] Computerized records decay at an even faster rate when they are idle. The Archaeological Data Service (ADS) has conducted a study on the shelf life of computerized records. The study demonstrated evidence that data stored in magnetic format can be lost in as little as ten years. The records were those of 180 separate Bronze Age Excavations in London from 1991 - 1996. The information was stored on 220 floppy disks. The damage effected 6,000 database and CAD (Computer Aided Design) files of otherwise undocumented research by the Newham Museum Archive Service. The magnetic coating on the disks degraded, damaging roughly 5% of the records. Since the technology to access the original files is now obsolete, the archive was migrated to the Archaeological Data server to prevent further loss.[36]

In the United States, the National Archives and Records Administration (NARA) contends with the preservation of historical documentation in many diverse and obsolete forms such as audio, video, and electronic records. As of February 1999, an estimated "960,000 electronic records," such as email, needed to be preserved.[37] With the short life cycle of an electronic record how is this to be accomplished? As the core material for museum collection management records and website content the preservation of valuable digital data is imperative. Are our precious database archives at risk to a similar fate?

Long-term preservation of electronic records depends on planning, management, and funding.[38] Can small or medium sized museums afford to maintain their database on an internet server? Can they afford to have a database administrator or a web master staff? If they can not, they will have to be responsible for preserving their own information. Several experts are working on problems faced by museums and archives struggling to preserve electronic records as both historical evidence and collections documentation. In the previous decades, backing up a database by printing to paper gave collection managers peace of mind. If traditional accession card files and/or object files exist this method is never worth the effort. This option offers no

automated means to retrieve data. Nor does it offer an automated way to convert records to an upgraded database program. It produces a cumbersome record that becomes unreliable once the first record is altered.

Information Technology experts are studying options for prolonging the short life span of electronic records. Dan MacCarn of the WGBH Educational Foundation in Boston believes that the creation of a "Universal Presentation Format" (UPF) can be realized. The idea is that if everyone used the same standard format, data would upgrade without loss or alteration as technology progresses. MacCarn sees two compatible interchange formats: Apple's "Bento Specification," and Avid Technology's "OMF," as giant steps toward a UPF.[39] Experts such as Jeff Rothenberg (Consultant to Council on Library and Information Resources) and David Bearman (Archives & Museum Informatics), call the UPF theory a "fallacy" arguing that no "computer technical standards" have ever remained readable as technology advances.[40]

Both Rothenberg and Bearman dismiss preserving hardware and software as another option. The argument against this solution also seems obvious. The museum would need to create a museum within itself to read its own records. Even if the records could be preserved who would manufacture parts for archaic computers to keep them working.[41]

Neil Beagrie and Daniel Greenstein of Arts and Humanities Data Service, London have studied six distinct cases to formulate a critical guide entitled "A Strategic Policy Framework for Creating and Preserving Digital Collections."[42] The study shows that migration is being used as a method of preserving records in museums. Data is stored in a software-independent format. The method requires the routine of moving or "migrating" the data as technology evolves. Bearman supports migration. However, Rothenberg does not. His criticism of this method points to the maintenance demands of periodic transfer of records from one format to the most current format.[43] "Something is always lost in the translation," claims Rothenberg, much in the way that art historians debate over whether to restore an old master painting.[44]

Bearman argues that Rothenberg's endorsement of emulation technology is overlooking the fact that it too, is a form of translation. In emulation, the obsolete program is imitated on successive generations of computers. Rothenberg explains that emulation technology mimics obsolete platforms to support digital documents in a more original form. He uses several examples of emulators, among them MAME (Multiple Arcade Machine Emulator) that enables a user to play an early video game.[45] Rothenberg also concedes that emulation is not a long-term solution to electronic record preservation. If experts can not agree on what strategies to use to preserve electronic data, what are museums to do? The only option is to keep a constant eye on technology and the peers.

Case Studies conducted by King's College in London of the Victoria and Albert Museum and the National Museum of Photography, Film, and Television reveal that both museums use SPECTRUM (The United Kingdom's Museum Documentation Association standard for collections) and have selected PhotoCD to store digital images.[46] "PhotoCD was selected because it is widely used, cost effective and easy to implement, and although a proprietary format it supports to a range of formats suitable for access purposes." Most of these images are not seen as requiring long term preservation because they have been created from secondary sources such as photographs. Both museums perform migration in-house to preserve electronic records. Preservation Practices for data stored online include making regular back ups and archive copies on tape or CD. The backups are stored off site for safekeeping.

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11 Adapted from Davis p. 22.

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SECTION II

Designing for the Potential User

Many museum websites displaying collection records do so to fulfill goals of access and education. In the context of the web both words are somewhat vague. How do they apply? For whom is the website designed to provide access and education, the worldwide audience? That would mean anyone and everyone, how can a museum possibly serve such a vast and diverse audience. Obviously, a website could never provide versions of collections records in every spoken language on the planet. Some limitations must be imposed. Most museum websites featuring collection records will be accessed by a wide range of users. To accommodate many different levels of users' intellect and interest websites should be presented in tiered levels. Numerous users will need diversified entry points to the collection information. For the purposes of this paper, I have attempted to identify specific approaches to designing museum websites for collection records based on extensive research and case study. I have examined approaches to web designs in terms of interaction with users. I have noticed that a design approach is more than a selection of content material. It is also a style of interaction with the user. How will they retrieve information and navigate through the collection records? I will show how styles of interaction are incorporated in both simple and complex museum websites, as well as characterize each strategy's technical requirements. Finally, I hope to offer critical perspectives on the effectiveness of the strategy in relation to the user's interaction.

Many exciting projects incorporate multiple levels of interpretation for various types of website users. The style of interacting with museum records online can be diverse and varied as well. Part A of this section examines websites generated with commercially available collection

management software. Part B looks at online databases formed by compiling the collection records of several museums into one resource designed specifically for online educational subscribers. Part C explores how national gateway sites link many sites together, providing a vast resource of collection objects records to the public at large. And finally Part D researches museum websites that use collection records enhanced by multimedia and interactive elements to interpret objects. This style website conveys relationships among collection objects. Additionally, it investigates advanced programming technology used in conjunction with databases to analyze museum records in new ways. The websites examined in Part D use multimedia as part of object records.

A. Designing for the Staff User

Today there are several software packages, reference tools, and collection documentation models in existence to use as guides. Several programs are designed to encompass every possible collection type and facilitate the web publication of records with add-on modules that operate independently of the CPU. Of the choices available, it is difficult to know which model to use. In light of the lack of a accepted universal format, how are museums to determine which standards will become universally used? The Canadian Heritage Information Network provides an invaluable service in its Collections Management Software Review.[46] Available to subscribers, the guide explores twenty-one commercial applications, program upgrades, development tools, as well as provides advice for deciphering collections management needs. The criteria used to evaluate the programs are explained within the report.

In the United Kingdom during the early 1990's, the Museum Documentation Association (MDA) published SPECTRUM, which is now accepted as the national standard for documenting

antiquities and art objects.[47] SPECTRUM was originally developed to be used in a database program called MODES (also developed by the MDA). MODES was designed as a complete package for museums documentation. In 1995, the MDA abandoned all its software development projects. When MDA halted MODES production, users feared they had invested in a soon to be unusable system.[48] Users of the program now had no means to upgrade their software or service the system. This case demonstrates how, MODES databases were rendered practically obsolete. If the data could not be exported out of the program, it could be lost. Can a museum ever recover from such a financial blunder? Fortunately the use of standards such as SPECTRUM helps prevent the loss of data when it is necessary to transfer data from one program to another. Efforts to establish new standards resulted in the selection of Multi MIMSY (developed by LASSI Consortium) as the vehicle to link the larger UK museums in the SCRAN Project (to be discussed in Section II Part C).[49]

Around the same time (in the early 1990's) The Dallas Museum of Art began using a software package to manage their "collection of over 16,000 objects."[50] They began with a simple goal; they wanted to create a resource to provide public access to quality images of the collection. When selecting collection management software they wanted to use a prepackaged system that would be cost effective while still meeting their needs. They chose Argus Open Edition for the database and PhotoCD for the imaging. Installed in 1993, their PhotoCD system still affordably produces both high and low-resolution images. Museum visitors can view the images displayed on a user interface called "Public Search" housed in the museum's *Collection Information Center*.[51] Originally, the interface provided six searchable fields for queries. After the museum discovered that users mistakenly enter terms in the wrong search categories, they modified the search criterion. Three search categories designed to encompass several fields simultaneously resulted. Kevin Comerford of the Dallas Museum explains, "The subject category for instance, lets users search by iconography,

style, period, technique, or materials."[52] The Argus lexicon permits this kind of flexibility. The lexicon is programmed to search the other specified categories when it searches "subject."

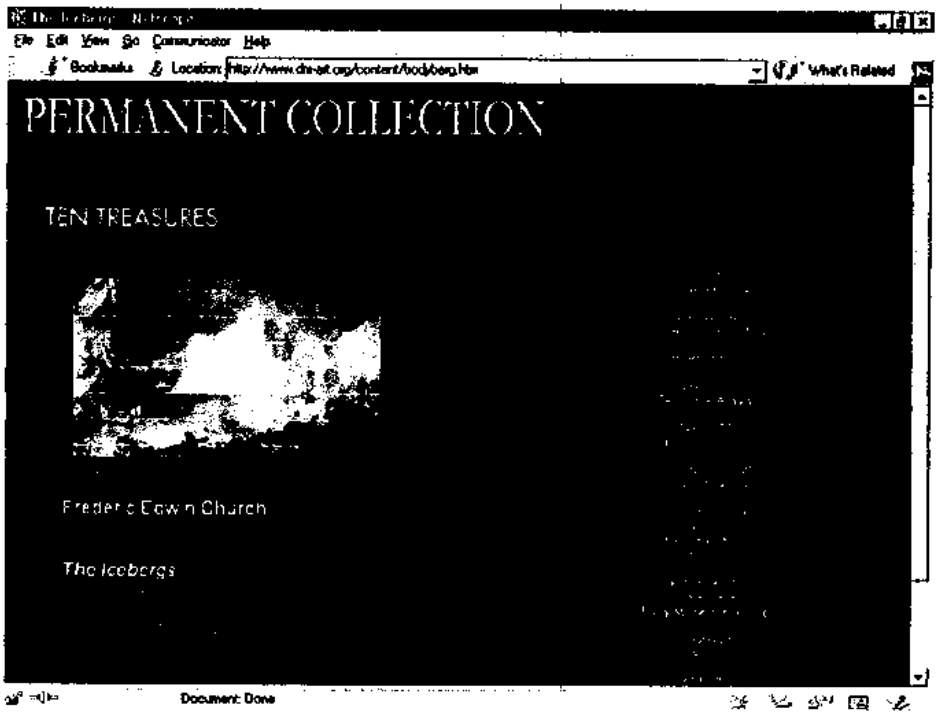

Figure 10. Example of a collection record generated from Argus Open Edition and PhotoCD
The Dallas Museum of Art

The Dallas Museum of Art internet project began as a page residing on the University of North Texas' web server. Today the website displays basic object records under a branch of web pages entitled *Ten Treasures* (Figure 10). The site does not feature a search engine for visitors to explore the collection, it just provides ten highlights for visitors. The web pages provide basic information about the object that is similar to what is routinely included in label copy, printed material, and a standard database. What is different with the web posting of the record is the © symbol and the link to copyright information regarding the digital image. (Copyright issues discussed in Section III)

The Dallas Museum of Art illustrates how museums progress from collection automation to a local area network (LAN) to the internet. The website began as a collection management and documentation project first, then a publication project within the museum itself. Now they have a small collection of records online. They chose basic software that would enable them to create digital resource files that could be expanded to other uses as the need arose. The website makes use of their resource files generated in Argus and PhotoCD formats. They approached their goals by developing a digitization plan. They prioritized their collection is batches of 1,000 objects at a time, first selecting prized possessions, then current exhibits, then objects rarely shown.[53] The museum selected PhotoCD to store 1024 x 768 pixel resolution images as source files thus enabling them to generate either high quality images or thumbnails from the same source file. Images can be used in the collection management database, the LAN used in the *Collections Information Center*, or on the web.

In large museums, the vast quantity of records results in the use of separate departmental databases. Providing access to collection records in a LAN (local area network) may be too complex and difficult to accomplish. Collections may be too diverse to design a standard file structure that applies uniformly across departments. Perhaps departments operate independently. Their records might have been setup differently initially. Restructuring the records into a centralized database may be too daunting a task. The Metropolitan Museum of Art in New York has been dealing with just such a problem. It operates separate databases for many of their collections. The museum's collection is so extensive and diverse that they do not have one central database operating on a local area network (LAN) that contains records for the entire collection.

In 2000, the Japanese Print department of the Metropolitan installed Symantec Q&A, the same program used by the Robert Lehman Collection. The databases however are independent of

each other. Symantec Q&A was selected for both collections of under 8000 objects. The program is menu driven and allows the user to design templates, fields, and forms. The Japanese print department was unsatisfied with existing references tools for collection documentation and needed to create a 41-page dictionary to ensure the consistent retrieval of their entries. They designed their data to be queried in several ways: by field search, keyword, text, or wildcard.[54] If a museum's collection is so diverse that one database system is inappropriate for every department, how realistic is it to believe that many institutions could contribute to a vast online compilation database? Several different projects have solved similar problems in different ways. Theoretically if every museum contributed content files created with the same software a compilation database would work. Currently several other departments at the Metropolitan use another software package, The Museum System™.

The Museum System™ (TMS) is collection management software; currently it is becoming a popular choice among large museums. TMS promotional materials boast the names of many big name museums, such as the Getty, Smithsonian, and the Metropolitan Museum of Art among others, adopting their software. Its attractively designed interface and graphics are making it the software of choice for those who can afford to choose. The system provides separate modules for special uses, one of which is public access. The TMS is a product of *Gallery Systems* and uses Embark software for their web application, called *eMuseum*. TMS was originally introduced in the Met's Ratti Textile Center to permit visitors to search the fragile collection via the computer and print images of works on several stations within the center. The interface was designed to be user friendly and display vivid images, with zoom in capabilities, of collection objects. The system has evolved today to be a total collection management system to be used both in-house and online. TMS allows web users to view basic catalog records consisting of images and text. Information is retrieved in fifteen separate fields

when the user enters a term. Up to twelve thumbnail digital images can be viewed at a time and when selected the enlarged images can include label copy along with the basic fielded catalog record.

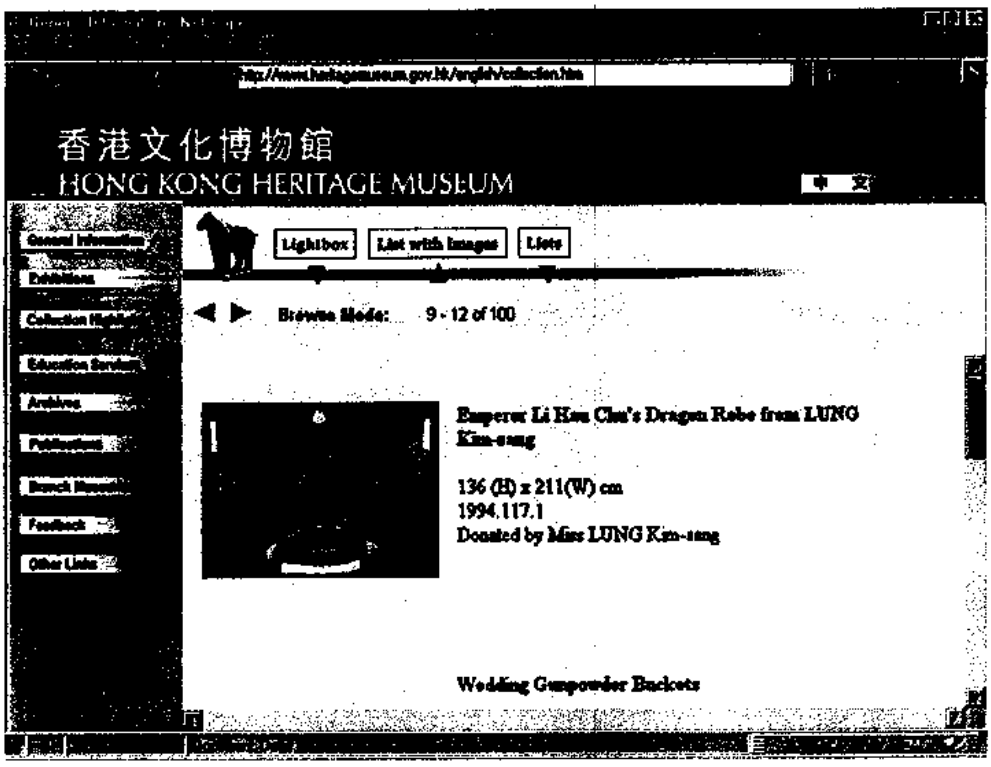

Figure 11. Example of a collection record generated by The Museum System™ eMuseum. Hong Kong Heritage Museum

The Figures 11 and 12 depict two sites hyperlinks to the TMS's website as users of the system. They demonstrate how the *eMuseum* can be customized for the online publication of collection records. The program features three viewing options for users, Collection records can be viewed individually in groups or as text only. Clicking on the image enlarges it. Various lengths of accompanying text can be included on the page.

The Hong Kong Heritage Museum's *Dragon Robe* (Figure 11) provides online visitors with the title, size, accession number, and the donor's name. Visitors to the site can browse related objects. This web page provides hyperlinks to 100 objects but the menu driven design only allows users to advance pages sequentially to browse the records. Although the page loads quickly, visitors

will have to be motivated and patient to view all 100 images. The amount of information within each record is inconsistent. Some objects have much more information than others, most of the text is very specific to the object itself and does not highlight relationships to culture, history, art, nor clarifying its uniqueness and importance.

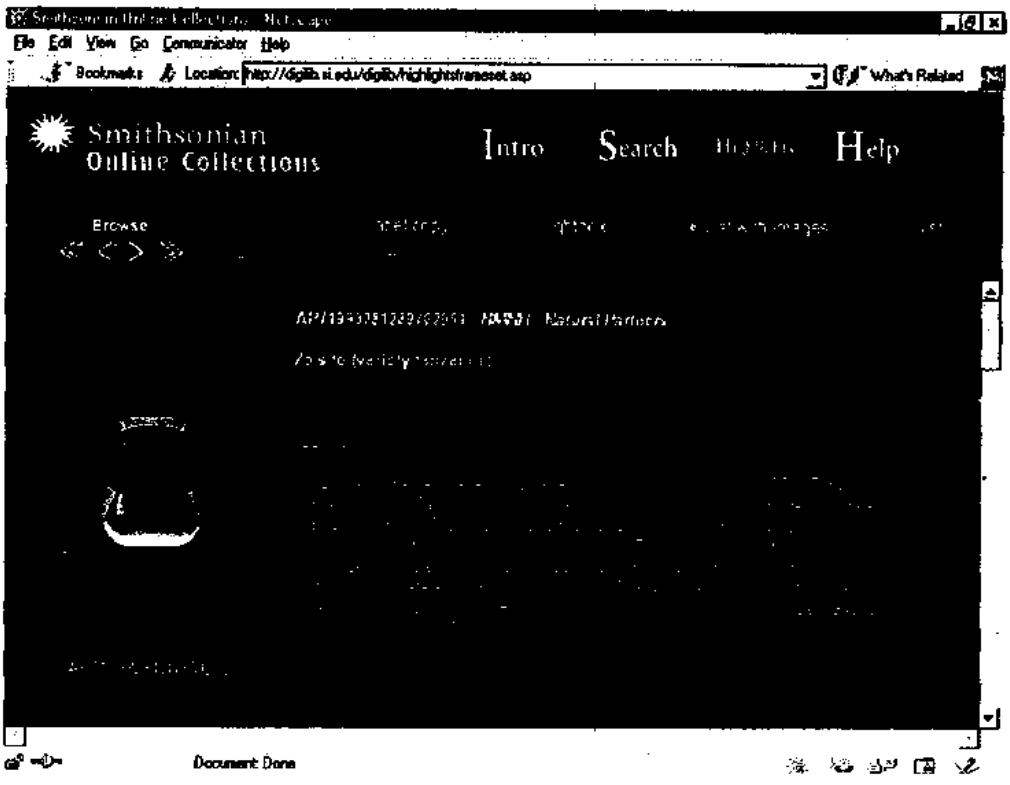

Figure 12. Example of a collection record generated by The Museum System™ eMuseum. The Smithsonian

The object depicted on the Smithsonian page includes textual information regarding the object. The two pages demonstrate how museums an customize the program. Each museum can enter as much or as little information as it chooses. The TMS eMuseum software does not accommodate multimedia files nor does it hyperlink collection objects to each other.

B. Designing Collaborative Databases for Educational Subscribers

If electronic collection records can be transmitted locally within a network, it can be transmitted on the web. The idea of using the collection records online naturally lends itself to the idea of information sharing. In recent years, several museums with common goals have partnered to merge their collection records for educational purposes. The compilation databases generated by these collaborations depend heavily on specific standards and metadata to integrate records from multiple sources into one central database.

In a compiled database, object records may be composed of many diverse file types. Each file is made up of records. Each record is composed of fields. Data must be filed so that the database program can sort it. Two data components metadata and delimiters, assist the program in sorting information. A delimiter tells the computer where specific information ends. Typically database software predefines the location of delimiters within each field and permits the administrators to extend or reduce the length of each field by repositioning the delimiter. The metadata tag tells the system how to index the file by its relevance. Metadata identifies each individual component of a record with a tag signifying to which category the data refers. In relational databases for example, a search in the field of "title" requesting "Paris" would retrieve records for every title in the integrated databases whose name field contains "Paris." Those records containing the word "Paris" as a geographic location would not be retrieved. In theory, metadata tags would distinguish the fields "title" from "geographic location" during a query in the "title" field. The metadata tags speed the search. The search engine only looks at the tags to find the correct fields to search. The data in every field no longer needs to be sorted through. A "keyword" query, however, searches every field to find the keyword. Records using "Paris" in both the "title" and "geographic location" would be found. A data dictionary is another tool needed to pair together database files with metadata. Organizers

of each collaborative project author data dictionaries to guide museum content providers on how to properly tag and identify their records for large compiled databases. When several records make up one file, such as a document, a database record, any number of images, and / or multimedia, metadata tags link the components of an object's file together.

MESL & AMICO - Compilation Databases

Two ambitious projects in the United States, Museum Educational Site Licensing Project (MESL) and the Art Museum Image Consortium (AMICO) have aimed at the creation of a digital image resource for university subscribers. Traditionally art history courses have depended upon slides as image sources for the classroom. As an idea, the creation of an online image library for the study of art history promises to expand the visual literacy of students and scholars by providing them with a vast collection of museum object images. The concept promotes access to images of works that may not be found anywhere else. The speed of online access could save researchers countless hours. Recognizing the fact that such a dream resource begins with baby steps both organizations forged ahead. The MESL project began as a pilot project in 1994 and pursued a short-term goal to determine if the creation of a digital image resource offered value to a licensed university audience. The AMICO Library, the next generation of MESL, on the other hand, is a long-term project continually expanding and evolving since its inception in 1997. Both projects functioned as test-beds in a effort to further the usability of online museum images. Their evaluation process incorporated university users' opinions. As AMICO's predecessor, MESL's trial and error approach contributed greatly to the mechanics of compiling digital files from multiple sources.

The two projects are very similar yet they are both very different. They both depended on museums as content material providers. Both organizations created new digital resources by the

merging of digital content authored by the contributing museums into a compilation database and targeted university communities as end users of their new product, an online image library. But it is not as simple as it may sound.

Content data originating from multiple resources had to be put into a common form. A simple analogy is that of language, the data had to be in the same machine-readable language. Therefore, to incorporate the content data into a comprehensive compilation database the organizers of both projects employed the museums to conform to standard data specifications. Requirements included text standards, digital image standards, metadata standards, and data dictionary standards. Although they do not specifically require the use of standard authorities such as the Getty's, ICONCLASS, or the Dublin Core, best practices dictate the need for such consistent standards to achieve the maximum benefit from database technology. In a database without a lexicon, data must be consistent.

Fields	Museum A	Museum B	Museum C
Object Name	Painting	Oil	Painting on Canvas
Medium	Oil	Oil on canvas	Oil

Figure 13. Example of Inconsistencies in Data Entry

If one set of records refers to an object differently than another, queries will not retrieve accurate information. For example (see Figure 13), Museum A uses the term "painting" in the "object name" field and "oil" in the "medium" field. Museum B uses the term "canvas" in the "object name" field and "painting" in the "medium" field when combined the will muddle the information. The redundant use of the word "oil" as both an object name and a medium is unnecessary. To complicate matters further, one contributor may have such inconsistencies within their own submitted records. It can easily happen when data entry is done by several different people, even the

use of punctuation can tweak a record one way or another causing it to be overlooked by the search function of the database. Although the MESL project anticipated how these inconsistencies could strangle a compilation database, the project itself revealed new difficulties. In turn, AMICO's specifications reflect the new technical wisdom.

The main difference between both projects lies primarily the deployment of the content data. In the MESL project, the participating universities designed and deployed the content supplied to museums for the end users via the local area network (LAN) and websites. This gave university faculty who were incorporating the digital images into their course work a range of options. They could design the website and use the images in any way they chose. Faculty could supplement the database with their own course material, create an interactive resource, or simply use the database. In AMICO, the library organizers ultimately design, store, and deploy the content files to its own vision, interpretation, and functionality. Distributed to a wide area network via the web, AMICO library users must log on through the websites of subscribing institutions. A university subscriber may provide access to its entire LAN but source files are not stored on the LAN server. Both the MESL content records and the AMICO library were inaccessible to non-subscribers.

The MESL project is easily comprehended by reviewing the framework as explained by Robert Yamashita.[55] He explains the theory of the MESL project as "packaged distributions of digital images of museum objects and their associated text as a new digital entity."[56] Yamashita divides the project into two "procedural elements" calling the participating museums "image and text providers" and the participating universities "image and text distributors."[57] He explains the methods of the *"digital entity's"* creation and distribution by separating it into several distinct phases: production, processing, deployment, security, and usage with each phase then broken down further into a series of tasks and general procedures. The production and processing phases were completed

by the contributing museums. The entire project went through the phases twice, once for each academic year of the project's existence. The basic overall operation proceeded in the following sequence. Museums selected content for digitization in cooperation with university faculty. Formats for text and digital image files from the participating museum's content records were established by the organizers. The digital records were also required to conform to metadata specification form. Each museum supplier used standard metadata, however, file-naming conventions were not bound by standards. Digital records were then generated and corrected. A primary distributor packaged the compilation of the museum's content records into the "digital entity". Each University participant then designed a website for the content data. Deploying the database was each university's responsibility included site integration, interface design, and (LAN) security.[58]

The MESL project is important for several reasons:

1. It pioneered the concept of the creation of a collaborative digital resource of museum object images.

2. The process of content creation and distribution revealed many technical roadblocks and possible solutions to the creation and distribution of digital museum images. The commitment of the participants to learn and restructure the project demonstrated that digital projects require extensive time and financial commitment from the participants.

3. It recognized the user (both faculty and students) to be as important as contributors in the design process of online digital museum images resources. Unfortunately, the faculty's influence on content selection did not rectify the problem of insufficient quantity and quality images. Many more museums need to contribute content material to develop an effective resource. As an educational

resource, a lack of relevant images limits usability. This implies that random submissions of museum object records to a compilation database will not create an effective resource.

Many professional participants in the MESL project have written papers describing it in detail.[59] The project began by selecting a target audience. It proceeded by selecting a hardware architecture, creating a software framework, deciding on content, and tailoring the interface to the target user group. It investigated both technical and managerial methods to create a digital resource and limit access to a collegiate audience.[60] Several shortcomings revealed themselves throughout the course of the project on both the museum and university sides.

The museums involved began with their own particular software, some used custom applications, and others used prepackaged applications such as Argus, Minaret, or Quixis.[61] Since their source data was written in different markup languages and arranged in different frameworks, the data creation phase necessitated the creation of MESL Data Dictionary.[62] Content data had to be organized to identify each content record by the museum name and the accession number of the object. Objects included were "represented by at least one image and a structured data record" which included up to thirty-two fields prevalent in museum databases.[63] Specifications were also incorporated into the data dictionary to link supplementary documents to museum objects. Though not mandatory, the use of authorities and thesauri such as the Getty's *Art & Architecture Thesaurus* (AAT) were suggested. The process of creating the content records revealed its own set of problems. Not all of the museums submitted complete records or used record fields in a manner consistent with the other participants. These variations and absences effected the usability of the new resource.

The process of structuring existing data to comply with a data dictionary is called mapping. The MESL project proved that mapping is a much more demanding phase of the overall scheme than

they had anticipated. To map manually is extremely time consuming and difficult. Software tools greatly expedite the process. Museums who were able to program software to automate data transfiguration had less difficulty mapping their content material to the data dictionary.[64] Howard Besser identifies "data clean up" as a common problem. He proposes "standard delimiters and standard character sets" and suggests that the "data export process would benefit from simple tools."[65] When he refers to "simple tools" he means user friendly software tools that will easily allow for corrections, updates, and other changes to both images and text records. High caliber tools enable editing to both individual fields and batches of files.

Most universities participating in MESL authored their own software applications to assist the deployment phase of the project. The University of Maryland, College Park, MD wanted to provide student users with dual screen viewing. They wanted the students to be able to display multiple images or text records at one time as well as allow them to search the MESL database while still displaying an image. To distribute the MESL package of digital records The University of Maryland developed Interactive System Image Searching (ISIS). ISIS combines proprietary software architecture called Caprina™, previously developed by the university's Teaching Technologies staff and a Microsoft Visual Basic development language.[66] The dual imaging tool called ProjectImage creates a partitioned desktop to give users flexibility to either view records, search, or build their own file. Files compiled by student users could then be displayed in class or exported in for out of class use.[67] Ellen Yu Borkowski, and Catherine Hays give ISIS high marks in usability.[68] Unfortunately, like many of the university participants, they found overall the range of available content records to be a limiting factor in the use of the MESL project's educational value.

A lack of critical mass assessment was reiterated by many faculty participants implying that it is not the framework and usability of the compilation database that falls short but the lack of

licensed images and text that contribute to it. Can we then assume from their comments that expanding the content offered will expand the resources value? If there are no focused comprehensive collections contained, just hit or miss stacks of data thrown together in a database how is it any different from a box of junk? A user still has to weed through to find the treasures. In a box of junk, an expert might be the only one who recognizes the treasure in the midst of the accumulation.

In an effort to use the interactive capabilities of the web medium the University of Virginia included a unique feature in their web interface. In 1996, they included an electronic request form on the MESL website.[69] Their hope was to encourage interaction and communication between university users and museum content providers. Initial complications with the form stemmed from the design; users did not understand how to use it. Once that issue was overcome the request form proved impractical because museums were unable to furnish the requested materials.[70] Websites designed to give the user materials they request is termed pull media. The MESL project was partially pull media because university faculty had some input in the museum's content selection. However, the participating museums found themselves unable to comply with user requests.

The Art Image Consortium (AMICO) is a non-profit digital library offering services to both museums and educational subscribers. AMICO has merged the collections of many museums into a 24-hour image library available for educational users. Their mission is to provide digital materials as an educational resource to subscribers. The project brings museum collections into academia much in the way of MESL with a few fine distinctions. Like MESL's compiled database, the AMICO library is a collection of content data contributed from consortium members. End users are educational subscribers to the library. AMICO distributors, however, are not the academic subscribers as in the case of MESL. Currently three distributors contract to deliver the library to

three separate user categories. Several factors based on potential user profiles determine those levels.[71] The number of distributors may soon expand to accommodate additional academic user levels. Distributors design the interface that delivers the library database to the user's desktop. They control the search engine and the site navigation. AMICO controls the compiling of the database. Although AMICO does not provide export tools for content providers to easily map their databases to AMICO's specifications, an application has been developed with The Museum System (TMS) to aid museum content providers in the mapping process. The TMS software tools allow one record at a time to be transfigured to AMICO specifications.

In AMICO, object files submitted must include a catalog record (composed of one digital image and text field documentation) as well as any other multimedia, text, or image records the providers would like to link to the object file. All the files for one object must be linked together by metadata. The metadata is an identifier that contains links to each part of the file. It is essential to access files. It tracks them and manages them.

Those who are familiar with hyper-media may be familiar with the terms 'push media' and 'pull media'. AMICO uses the term 'push media' to describe their library resource. It means that they provide the information that the content providers, in this case the museums, want to provide. The library does not exist to give users what they request, a.k.a. 'pull media'.[72] AMICO organizers see it as an evolving resource that will be led over time by the contributors' submissions of textual and multimedia input rather than solely by their submitted images. The organizers of AMICO have no recipe dictating the kind of content needed to make the library an educational resource. The specifications pertain to the physical format of records necessary to compile the database. AMICO is not authoring the image library in any way. The museums must decide for themselves what object records are appropriate. There is no apparent collaboration between museums to provide a cohesive

direction in the content development of the library. There does not seem to be any plan for museums to contribute common collection objects records. AMICO only requires content providers to submit 500 object files a year. Those files could be anything the museum wants.

Hypothetical - Object Records Contributed as Content for Digital Library- 500 Objects Annually

Museum A	Museum B	Museum C	Museum D
100 Photographs	100 Decorative Arts	50 Photographs	
400 Miscellaneous	100 Paintings	50 Paintings	250 Miscellaneous
	100 Ceramics	50 Ceramics	
	200 pre-Columbian objects	150 Native American objects	250 textiles

Figure 14. Example of Inconsistency in AMICO's critical mass

When this group of objects is put together is a comprehensive educational resource created? Within each major category, there are national and period categories; there is no rhyme or reason to it. A huge variety of unrelated object records does not necessarily make a valuable resource for educators, researchers, or scholars.

Academic Testbed users of the AMICO library found in several instances that successful use of the library depended on several factors. The *AMICO University Testbed Meeting Summary June 3-4 1999* looks at the Testbed from several points of view: teaching, using, organizing, training, and structuring. Many of the evaluations, though looking at the project from different angles, conclude the same key points. Repeatedly, Testbed participants claimed that successful use of the library depended on several things including: technical support, integration, and promotion by the hosting university, and user training (for both faculty and students) in using the library. The Testbed also found that non-art classes were more likely to use the library in teaching than art classes and that art

history faculty felt that their 35-mm slides provided a better image resolution than the digital library.[73]

After all the intensive labor and financial investment in MESL and AMICO to develop a resource for the study of art history is the digital collection of images a valuable resource and if it is to what degree? Will educators and students use digital resources? There have always been opposing opinions in the field of art history as to the value of using surrogate images for the study of art history. Many art historians find the fault with slides and attack universities' for churning out art history majors that are visually illiterate.[74] Could not the annual fees paid to be a subscriber of an online image library such as AMICO be better used to give students first hand visual interaction with art objects in the actual museums themselves? Is access to more images more educational value or is access to fewer real objects more value? Pixels comprising digital images, especially those with low resolutions greatly alter the visual appearance of the original work. Details in color and marks can become obscured and omitted. Is the study of such images in a university art history course ultimately rendering those details insignificant and presenting the artist's technique as secondary to the composition? My supervisor at one of the museums in which I am employed asked a very pointed question when we were discussing the AMICO Library and its incompleteness as a resource, she proposed, "How can you teach art history without the Mona Lisa?" The fact is that any responsible art history professor would not. They would not edit their course and customize it to teach with a limited source of less renowned works.

Figure 15 shows an AMICO record (which has several paragraphs at the bottom of the screen not visible in this image which characterize the painting), it is one of several records retrieved from a "Willem de Kooning" query. The blue hyperlinks provide background information for the work of art. The query did not however retrieve any paintings from de Kooning's *Women Series* created

during the 1950's, quite possibly the group he is best known for. For a student researching deKooning is *Woman* painted in 1944 satisfactory? Most books surveying twentieth century art provide more images and text on deKooning than AMICO.

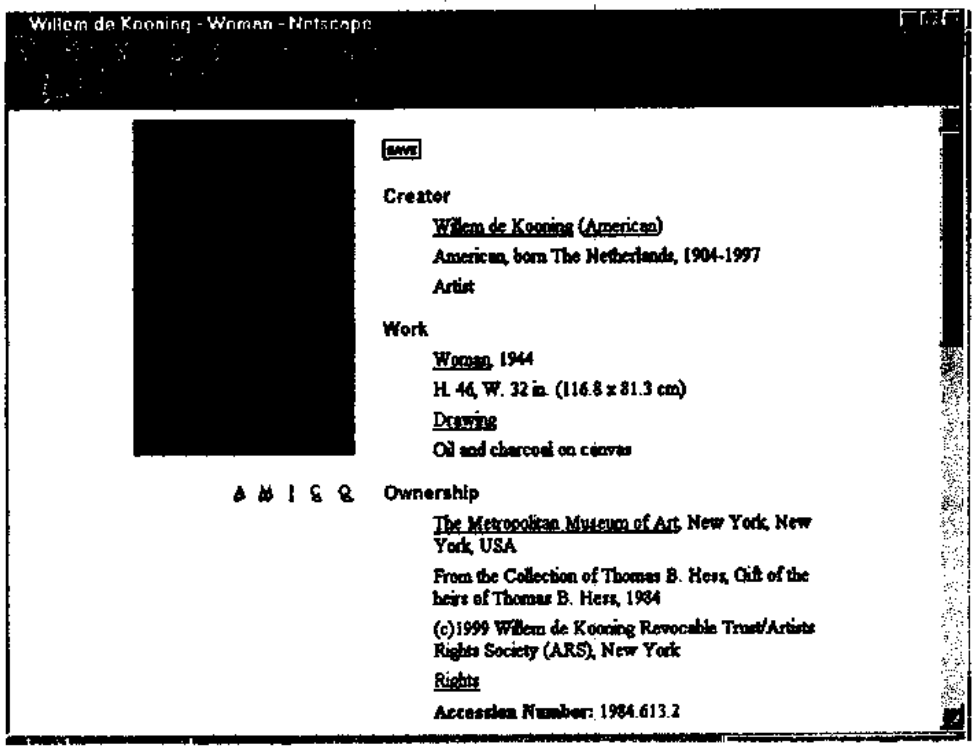

Figure 15. Example of an AMICO collection record

Formal published evaluations by test-bed participants of AMICO and MESL found that faculty were not altogether satisfied with the content selection of included images. "The process was cumbersome and frustrating; in some cases, no match existed between those willing to teach using digital images and the content available."[75] Each university user's needs may not be served by the available content. To incorporate the material faculty will need to redesign courses. The AMICO Testbed evaluations reported that university participants who trained students and faculty to use the database had higher approval ratings.

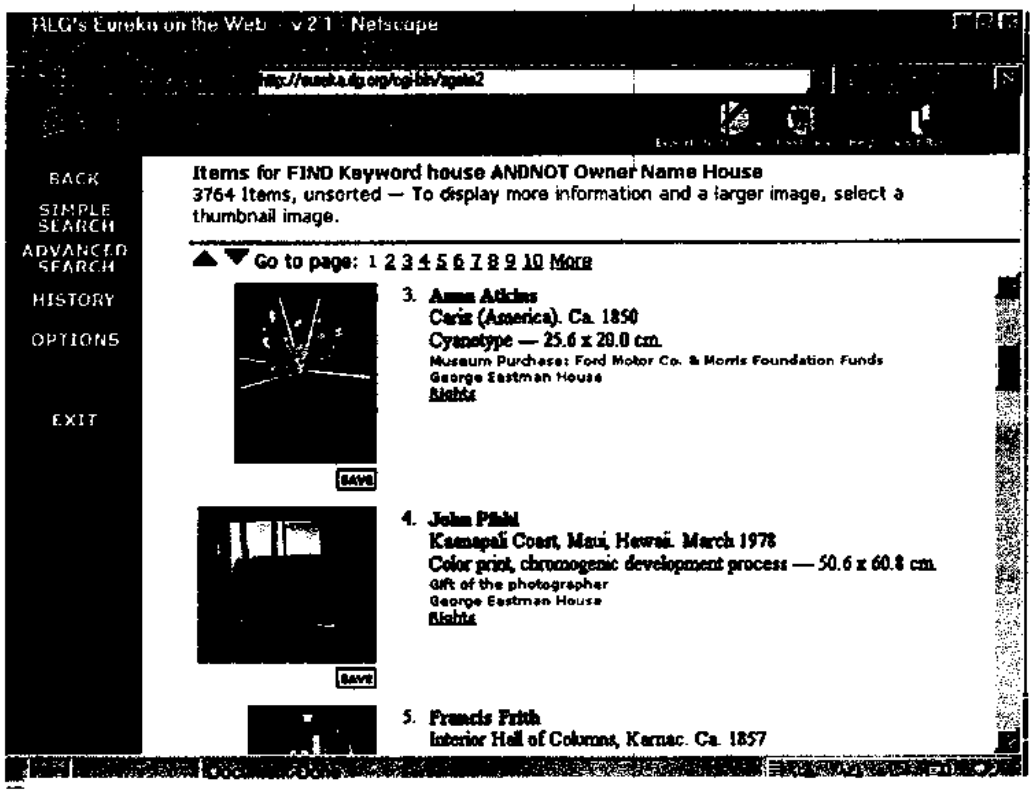

Figure. 16. Example of an ineffective AMICO search.

The following AMICO screen (Figure 16) demonstrates the information retrieved when the term "house" was entered into the "subject" field of the search engine. The operator of "not George Eastman House was included to eliminate the entire collection of the George Eastman House and only retrieve hits that contained the word house in the title or subject category. As you can see from the screen results, there are several bugs still need to be worked out with the AMICO system. When another search produced less than satisfactory results, I sent AMICO a message, in my frustration, in an effort to resolve my query problems. I was trying to find images of figurative paintings and still life since 1945, I used advanced search, I used the drop down menus, I tried keywords, mediums, subjects, etc, and I referred to help, with limited success. Jennifer Trant, Executive Director of AMICO, responded to my request for help: "The kind of query you are interested in making is one

of the more difficult to do using museum documentation, since museums focus on describing individual works and you're interested in grouping works by their stylistic characteristics. The best way to cast a broad net is with keyword 'painting' and a date range 1945 - 1999. It does produce a substantial number of works ... They are working on that now."[76] After trying her suggestions I was not able to use AMICO to find what I needed.

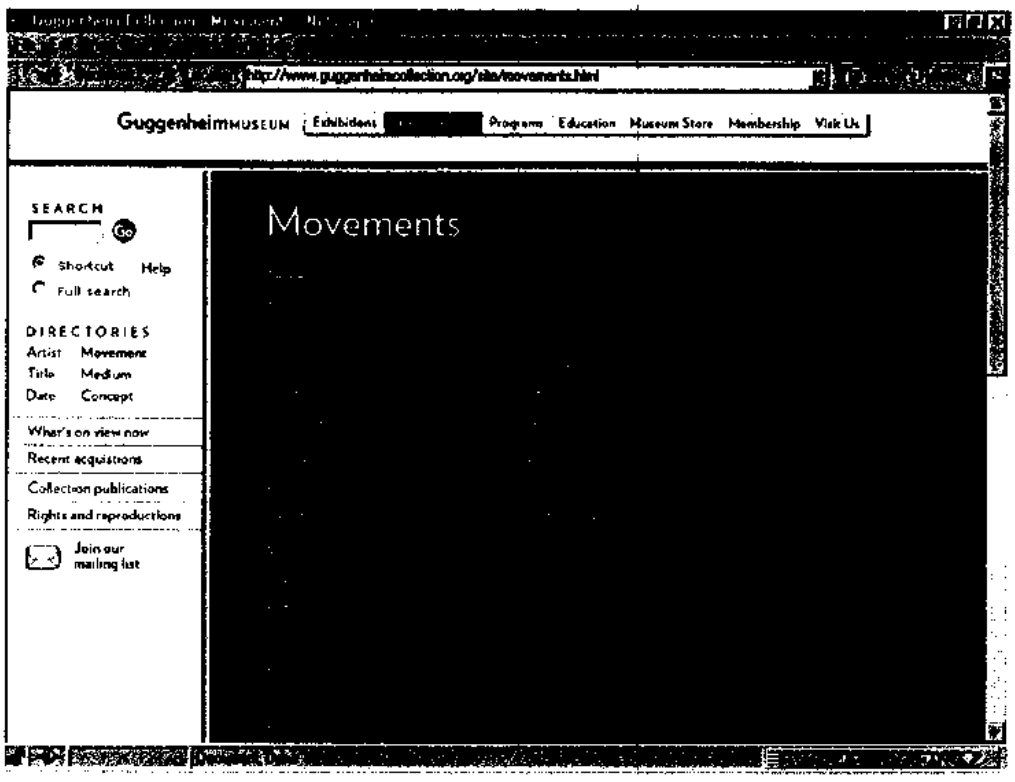

Figure 17. The Guggenheim website April 2001.

The new design of the Guggenheim website, which debuted in April 2001, is perhaps a better educational resource for college students. On the left side of the every web page, six directories organize the collection into browsing categories. *Movements* (Figure 17) is a web page which categorizes collection records. This kind of organizational system might serve a college level audience better that the AMICO organization. For the user who knows a little about art, (someone

who would search for images with terms more sophisticated than a "woman," "flower," or "obelisk") using terms like "Surrealism" and "Pop Art" makes more sense. The Guggenheim site is flexible enough to accommodate users of different knowledge levels. An AMICO user needs to know exactly what they are looking for to find it. The new Guggenheim site also serves users who know exactly what they are looking for by providing them with a search engine (upper right) to enter specific requests, as well as those who do not.

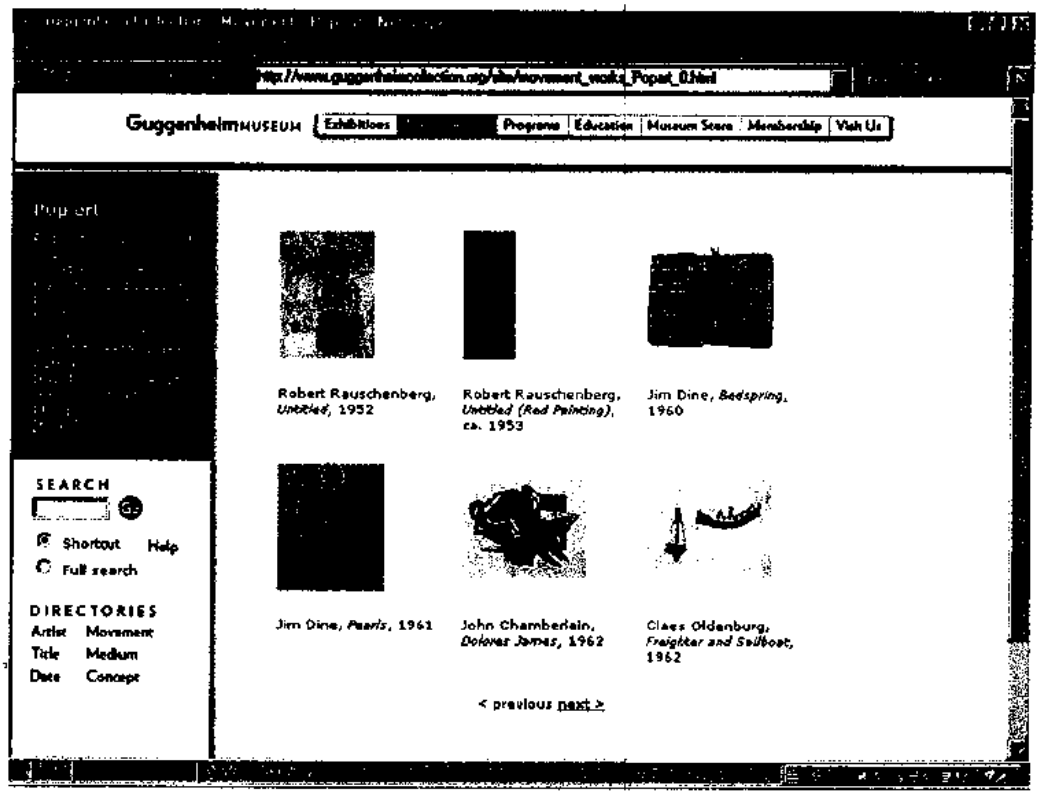

Figure 18. The Pop Art Page of the Guggenheim Site

When a visitor selects the choice of "Pop Art" at the Guggenheim site, it displays basic information about the Pop Art Movement and several thumbnail images. Users have the option of clicking on images to explore each image or to continue browsing. As an educational tool, the Guggenheim site is far more versatile for a faculty member who does not restructure curriculum. The fact that the website is free and available to anyone with a home PC and internet connection

makes it even more appealing. The main variable to contend with for faculty members is the fact that the site might change without warning.

C. Designing Public Access Resources

Public access refers to a website that is accessible through the web to anyone, not limited to members or subscribers. Instead of creating a reference tool for a specific educational group, publicly accessible databases records are not culled to fulfill an educational curriculum or preset criteria. The idea is to represent the institution's entire collection online. All objects are treated equally and available for public inspection twenty- four hours a day, everyday.

Several ambitious national projects bring together collections from different museums' representing a region's cultural heritage of a region. Such projects encompass art, history, science, archives, and cultural collections. The idea is to use the internet as a form of publication. In theory, these public access websites are cultural heritage catalogs. The sites often include multimedia files along with text and digital image files. Such projects are generally accessible to anyone but several do incorporate some forms of educational subscription to their online resources. The concept behind many of these projects is that cultural collections of a given region or nation are equally important and should be equally accessible to the public. What is ground breaking about many of these projects is the idea of bridging the digital divide. Many small institutions hardly have the funds or manpower to develop an in-house collections database or an independent website of their own. These collaborative projects recognize that fact and that most of those institutions might never have the funds to independently create any form of collection publication, database, or website. In an effort to prevent rich organizations from overshadowing the modest ones, government organizations have

stepped in to fund many of these large projects. The goal is to create vast national electronic resources allowing both large and small institutions a place on the information superhighway. Some of the public access sites rely on the use of standardized digital files as content for compilation databases. On the other hand, several link independent sites together via gateways. Museums contributing to the gateway sites do not have to adhere to as many strict data specifications as compilation databases. Gateway sites tend to access records from multiple sources that remain stored at multiple locations. They depend heavily on file formats and interface technology to retrieve cross-domain heterogeneous records. The gateway connects directly to each contributing museum and simultaneously searches each separate database for text, image or media files.

The 24-hour national museum website is an appealing concept from an educational perspective as well. In theory, an internet accessible collections database could free the museum from any number of constraints including demands on staff to monitor researchers. For the past several years the United Kingdom has focused on two major issues: the establishment of 24-hour museums via the internet and a National Policy for Documentation.[77] Their strategy presumes that the widespread acceptance of uniform standards for collection databases is the only way for institutions to share data electronically. Conceptually, shared databases would retrieve requested information from several museums' collection data at once. One day in the near future a query would be capable of, for example, locating every works by one artist in any given region.

One such project is well underway in the United Kingdom, the Scottish Cultural Access Network (SCRAN). SCRAN has brought together the entirety of Scotland's cultural heritage collections into one online cultural resource. The project, financially supported by the Millennium Fund of the Heritage Lottery Commission, provides funds to support heritage organizations in the creation of standardized machine-readable data regarding Scottish culture and history. SCRAN

functions similar to that of AMICO. Grant holders supply the documentation. Records are then stored on the Database Management Server. Funded groups must comply with both the technical and conceptual criteria established by SCRAN. Content must be Scottish in flavor and be conducive to internet presentation text and multimedia file formats. PhotoCD is the recommended format for images, but TIFF files are also accepted. From a master image, digital thumbnail images are then created. SCRAN requires non-exclusive rights of the data files for commercial and educational purposes.[78] SCRAN's goal is to incorporate 1.5 million text records and 100,000 images.[79] The database also contains multimedia records that are available to institutional subscribers. Technically SCRAN is similar to MESL and AMICO in its dependence on standards to make the compilation database function properly.

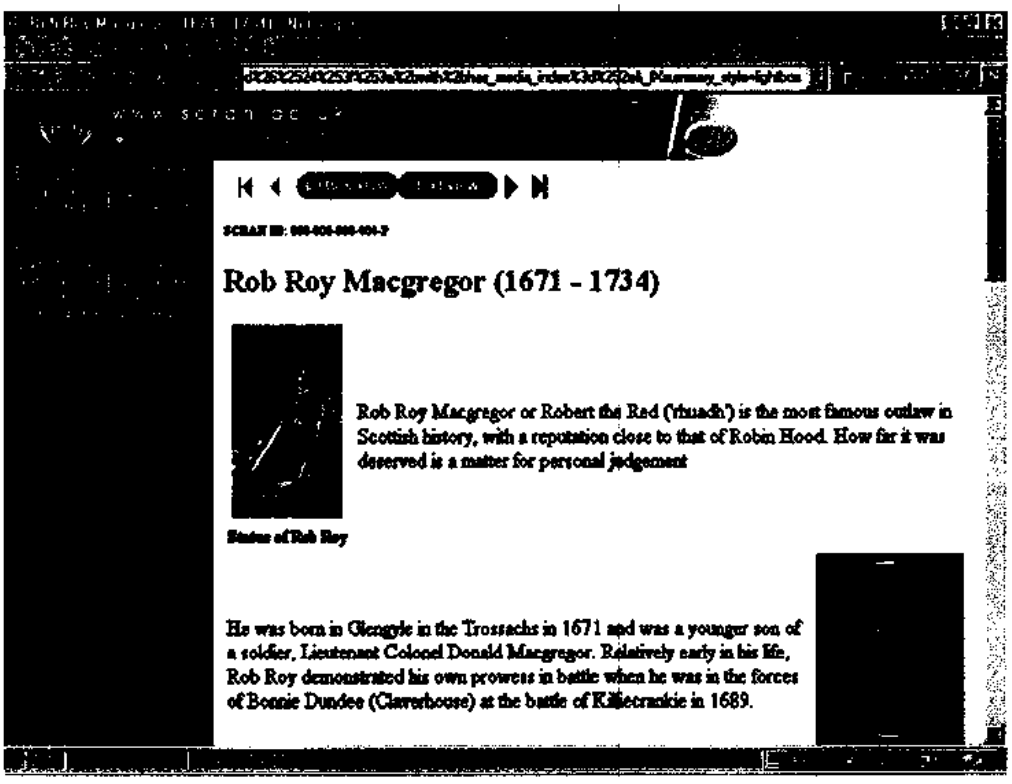

Figure 19. SCRAN Pathfinder query result requesting "Rob Roy Macgregor"

The Homepage of SCRAN presents many choices. The basic organizational structure of SCRAN groups the merged object records into preset groups called "Projects" and "Pathfinder" identifying every object in the database with a project or path (see left side of screen shot Figure 19). The scheme of the projects establishes relationships among objects to relate them to the cultural heritage of Scotland. A "Quick Search" function offers the fastest means to locate the collection records. When "Rob Roy" was entered, 97 hits were retrieved, with 10 presented on the screen at a time. When first hit PF icon (SCRAN symbol for "Pathfinder") was selected a screen with object records appeared (Figure 19). It depicts several objects owned by Rob Roy MacGregor, paintings of statesmen who had dealings with him, and images of documents relating to his business transactions. All objects depicted are hyperlinks to image enlargements, along with additional hyperlinks at the bottom of the page to other historical figures. Though the intention is clearly to create a cultural and historical context from the information contained in the database, the site demonstrates how fragmented a shallow design can become. The user does not know which link to select next. Even with the array of choices the user still does not have a clear perception of Rob Roy. The information is either too specific or too vague.

"Pathfinder" presents the user with the choices displayed in the blue circles. The selection of the circle "People" reveals an alphabetical list people. A user can browse through seemingly endless alphabetical choices and select the text. There is no way to jump ahead to hits beginning with another particular letter in the alphabet. The whole process is cumbersome. The fragmentation continues no matter which direction the user takes. For school children with a shopping list of topics to research, SCRAN probably provides an alternative to an encyclopedia. The objects, however, seem to be represented for their historical significance rather any artistic one. In the section, "Project" the website uses a map metaphor for users to click on a location (Figure 20). The map

contains no names for towns or cities leaving the user to guess locations. How is a user going to use it effectively? If the user does not know the name of a specific place to enter, they are lost. Clicking randomly on an area does not improve the site as a tool.

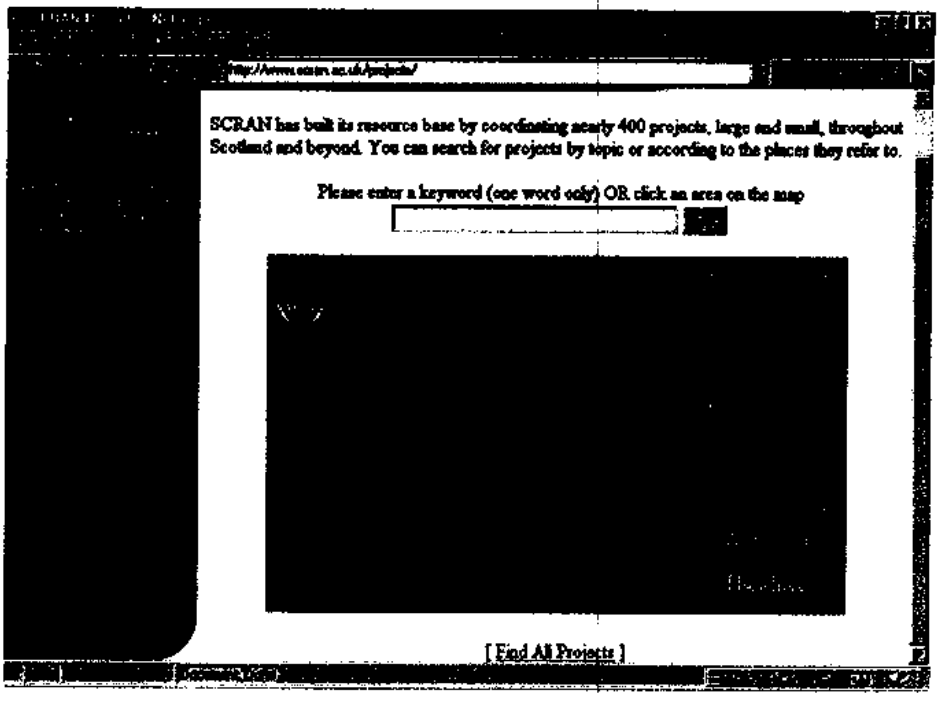

Figure 20. Click on map - SCRAN website

Figure 21 shows the abundance of hits retrieved when an area on the map was selected. At 1026 hits the list is longer than anyone would want to weed through. A user would have to wait for page after page to load. The site tries to give the user an indication of what each link has in store by the explanatory description provided but as a public resource it is difficult to use. As an educational resource incorporated into the national school curriculum the website seems more appropriate for users armed with a school assignments to look up.

SCRAN's shortcomings stem from its attempt to fulfill several roles. It wants to be an educational resource, it wants to be a resource for the public, and it wants to organize the collections of every cultural heritage institution into one centralized resource. AMICO tries to fulfill a more

focused goal and still faces the same problem. AMICO does not even try to organize its compilation database and it is a fragmented resource. SCRAN organizes its compilation database with hyperlinks interpreting relationships between objects and it is still a fragmented resource. The flaws lie in the conceptual design of both the databases. Designers of both sites have compiled collection records of many institutions but their resource is not authored. The resource does not even function like an encyclopedia, it is more like an electronic phone book yet not as useable as the yellow pages.

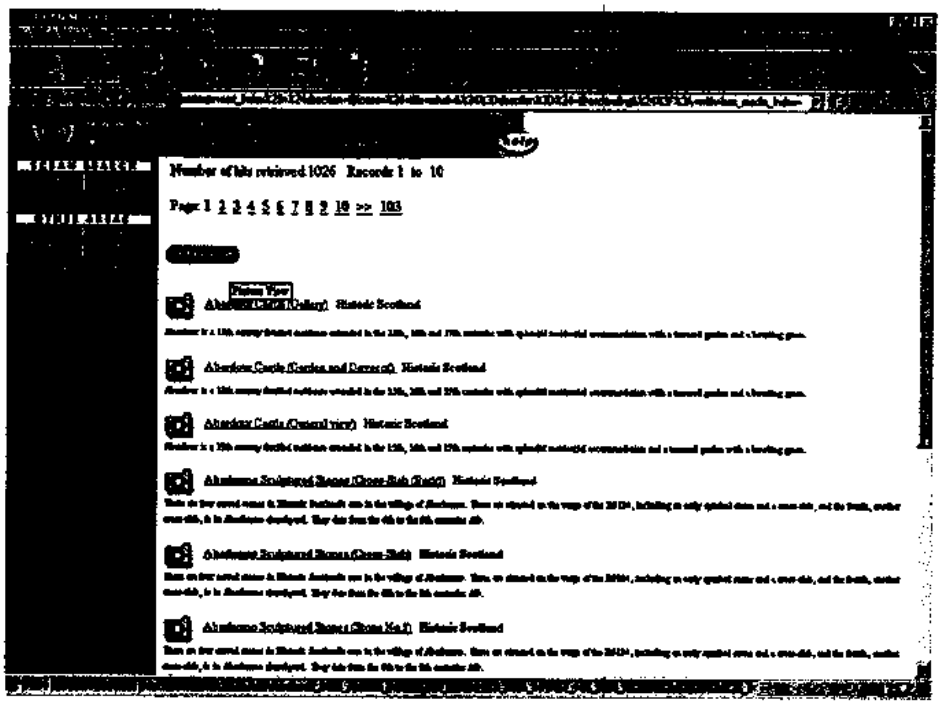

Figure 21. Example of the Query Results Retrieved when an area of the SCRAN map is clicked on

Gateways

Another approach to sharing information used by websites is demonstrated in regional gateway sites. In intention, SCRAN is a gateway because of its desire to connect together the museums in the entire country of Scotland into one main database. By technological standards however, SCRAN is not a gateway, it is a compilation database. One of the driving forces behind

a gateway's conception is the desire to create a national or regional authority on cultural resources. This authority creates credentials for the participating content providers. The gateway's authority endows a stamp of authenticity to those organizations admitted into the network. The network benefits by completeness of the resource thereby making it a strong competitor for "other forms of entertainment and media."[80] This attitude may have prompted gateway founders to find alternatives to information sharing. The primary focus of a gateway website is not to redistribute standardized museum collection information but to provide access to it.

In a gateway environment, obstacles to information sharing can be overcome by creating readable data. Unlike a compilation database that requires content providers to conform to standard specifications, gateways acknowledge the idea that universal standardization is unobtainable at this point in time. Standardization is attempted at the systems level, not the content level. Information System Standards attempt to integrate information by using translators to interpret across hardware and software platforms. Using interchange formats for creating data, such as TIFF for images and MIDI for sound, make the data readable. There is still standardization but the standards are not as rigid. Although metadata specifications and data dictionaries do not have to be conformed to using accepted standards, dictionaries, and thesauri as guides to enter data into the system also make data more readable, therefore retrievable. Databases that conform to protocols and standards allow translators to separate the framework of the databases from the data itself.[81] A gateway database is integrated not compiled. In integrated databases, interchange technology searches query fields existing in the framework many separate databases. Once each framework is translated by the gateway, the data contained within the fields can be retrieved.

Gateway sites have evolved from the idea that object files used for database content are new electronic objects. They are separate from the objects they represent and from the museums that own

them. The digital representation of an object whether it be a text record, sound record, image record, or video record is now retrievable across internet connections. The object files of every content contributor do not have to be compiled into one centralized database. Gateway sites bring together query results from multiple sources spanning across nations and internet domains. A query may find hits that are formatted in different file types or written in languages. A gateway interface search engine reads the indexes of integrated sites to find hits.

Different schools of thought have developed to make the Gateway sites succeed. As in the previous section for databases, standard practices and uniform file formats are what make the system work. But as Douglas Mackenzie, Sandy Kidd, and Morvyn Myles point out that universal agreement on standards is impossible. The group says,

> "Apart from the common problems with standards in computing:
> technology renders them obsolete before they are finally ratified;
> ...too much time is spent discussing the standard instead of finding
> something useful to do with the results..."[82]

Based on the premise that potential users for online collection records will not phrase questions in the same way a curator would; or that users would not want to retrieve the same kind of information, they believe in the construction of interfaces. Kydd's and MacKenzie's exploration of migrating kiosk applications to the web environments address the needs of users, not the standardization of data. They believe that it is not the data does need to be altered, just the package that contains the data. When examining the needs of the user, whether a collection manager, database administrator, or a "web tourist" they conclude:

> "The compromises made in choosing a system to satisfy both
> needs is likely to satisfy neither so why try? Use two separate
> systems, two different databases... "[83]

They stress that significance of the content is the core data not its "format". Interfaces like MusDev (developed by DMC) work as tool kits to move data from one database to another. DMC's WebDev moves data from the database to the website by isolating data from graphic elements. WebDev can read and translate heterogeneous records across domains by using Structured Query Languages (SQL) to read differing databases. This approach centers on the development of toolkit applications that deploy filters to address the needs of a wide range of user groups. An interface could for example, incorporate a thesaurus into a keyword search engine. The feature would retrieve hits on the synonyms included in the thesaurus for the keyword entered by the user.

Gateway sites have been developed using other interfaces to connect museum databases across nations without compiling them and redistributing them. One national gateway, Australian Museums On-Line (AMOL), is referred to as an "Information Meta-center."[84] The integrated design of a gateway permits expansion and revision by content providers at their conveyance. The gateway links together sites stored at different locations rather than compiling them. It functions as a data network, not a database. A gateway web design must still maintain some standards but not for content. Protocols for information exchange must still be upheld so that the network can find the pathways to retrieve information. In fact, gateways share the same problems as compiled databases. Sarah Kenderdine of AMOL believes the "challenges facing gateways" are: "aggregating a critical mass of digitized information, developing and implementing standards of exchange for museum information, understanding audiences for museum information, commodification of information."[85]

But do fewer restrictions imposed upon content specifications enable data to be presented in a way more relevant to the user's interest? Like AMICO and SCRAN, a gateway still retrieves fragmented hits of information. It does, however, minimize the work for museums providing content

materials through the site. It also permits content providers the freedom to emphasize their own style through its various levels of hyperlinks.

A gateway site links together miscellaneous data. The core content files are stored by authoring institutions and accessed through an interface. The Homepage of Australian Museums On-Line provides several navigational choices. Collection records are available on AMOL through searching and browsing preselected "Stories." Users may select a way to retrieve files. Their choices include: "collections database, selected objects, stories, guide, hosted webs, and other databases."[86] The search engine finds records from all over the nation based on typical fields. The "Stories" feature links users to collection records authored specifically for the web. To explore the objects online a user can select *Open Collections*, which can search over 470,000 object files. Figure 22 shows the search results for a keyword query "horse" and "painting." The search retrieved forty-five object records from institutions located across the Australian continent.

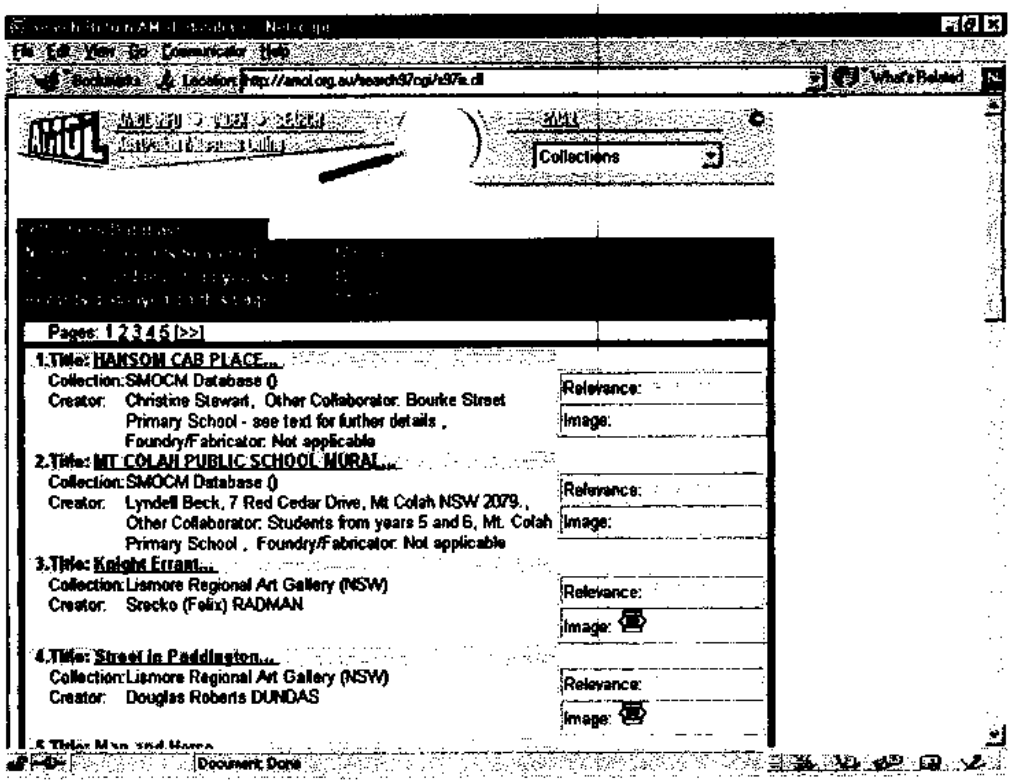

Figure 22. Australian Museums Online Gateway Search Results

Retrieved records show a filed called "collection," meaning the institution that owns the object. Like SCRAN, if the text fields "collection," "title," and "creator" displayed are not enough to give the user an idea of what the object record is hyperlinked to a user must use trial and error to select each hit. Object records containing digital images are indicated on the right side by the blue eye next to the word "Image." Some object records without images contain hardly anymore information than what is contained on the screen search results. The object records retrieved from AMOL are very much like the records generated from software packages such as Argus and TMS.

If a user selects the "Stories" option from the AMOL Homepage, a more thematic approach exploring collection records is presented. These choices take the user in many different directions and each choice interprets collection objects in their own unique way. The "Stories" page of the website is an event driven page. Images blink on and off with the movement of the mouse. Users can roll over each title to get a glimpse of a collection object. From the simple titles and the image the user still does not know what to expect. Some of the fourteen choices lead to interactive multimedia pages others are links to the Homepages of specific museums.

The AMOL gateway functions as a center to many institutions and their individual philosophies of what online access to collections should be. One possible selection, *The virginal* (Figure 23) is focused and specific to one collection object. *The virginal* however is perhaps better described as online exhibition than an online record. The web page shows one large image of the instrument, the record for the object is presented in an event driven environment. When the user moves their mouse across the image, different choices are made available for the user to select. Close-up images of the inscriptions and painting on the instrument are possible choices while another choice allows the user to download sound files of Nicholas Pael playing the instrument. Playtime of sound files ranges from 3 to 7 minutes. The style used for *The virginal* satisfies a user in a way

different from that of a database record. This style of interaction begins to explore the object's relationship with the world in less fragmented way. It provides a context for the object. It is in many ways more educational than the database reference tools created by AMICO, SCRAN, and similar software packages.

Figure 23. Homepage of online exhibition on Australian Museums Online *The virginal*

D. Designing to Interpret Collection Objects

Most of the websites examined so far have supplied users with basic facts museum objects. Some of the sites have tried to provide additional information to users so that they may learn about the museum objects' significance and history. Most museum websites showing a large number of collection records begin with a database design and shallow typology. This approach does not always give the user a deep understanding of collection objects. Unlike museum exhibitions in which designers provide an environment for understanding collection objects, websites are far more

limiting. The database approach tends to isolate objects by neglecting to relate them to the rest of the world. Basic database designs do not interpret objects for users, they do not connect the objects to the world that conceived and produced them. The unique nature of the web environment can lead users to explore relationships easily through hyperlinks and event driven content. Emerging technology in multimedia, adaptive intelligent systems (programs which respond to the user's input) and data mining (sophisticated databases which cross-tabulate information) can greatly enhance sites by providing the user with new tools to analyze and explore collections. More importantly, these technically advanced systems take advantage of the medium to provide users with an innovative and unique educational tool.

In-depth Programs, Multimedia & Edutainment

Anyone who has ever watched an educational program or a video game is aware of the extensive capability of the multimedia to captivate users. Many exiting virtual programs are available within museums on kiosks, CD-ROM's, and LANs. Using more than a database catalog record (consisting of a digital image and text), these exciting interactive programs explore collection objects in new ways. In the United Kingdom two projects use virtual technology to provide a spatial context for their collection objects. COMPASS (Collections Multimedia Public Access System) is a project developed by the British Museum. The database provides an enhanced computer reconstruction of historic sites that no longer exist. Accessible from monitors at two locations within the museum, the database uses keyword retrieval fields such as objects, materials, periods, people, and places. The 1997 prototype premiered with 350 objects and expanded to 5,000 in 2000.[87] The Jorvik Viking Center, in York used 3-D computer modeling to "reconstruct real Viking faces."[88] By

no longer exist the technology has some importance. As in the case of the Inuit exhibit the entire approach is contrived, expensive, and offers little educational value for users. The exhibition and the objects depicted do not resemble the original objects at all. Their attempt at edutainment misrepresents the Inuit Culture. Other kinds of museums approach website design inventively while adhering to the facts.

It is not practical for museums to try to duplicate the dazzle of kiosk applications online. The expense and technological demands would overwhelm both museums and visitors. Several museums have developed online exhibitions that work with small groups of collection records complimented by plug-ins, emerging technology, and multimedia to entertain audiences while they browse collection records. By using these elements to encourage interactivity online exhibits enhance collection records to provide a more enriching experience for users.

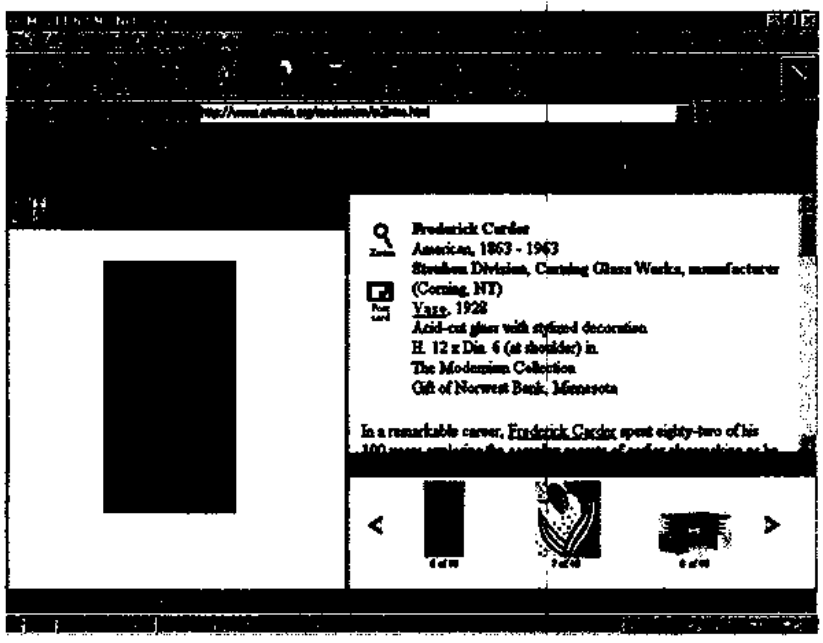

Figure 25. Collection record in Minneapolis Museum of Art's online exhibition *Modernism*

laser scanning "1000 year old skulls" from the collection, the center used the models generated to create mannequins for display.

The Jorvik Viking Center has worked with the Canadian Museum of Civilization on other projects involving 3-D modeling to give museum goers the capability to virtually move objects within the computer. *Inuit 3-D* (Figure 24) available through Canada Virtual Museum creates a 3D virtual museum space online. Users can explore the space as if they were walking through it themselves. The hyperlinks call up collection records and objects rendered with 3D modeling technology. The objects can be twisted and turned by the website visitor. Together both museums are building a 3-D archive of collection objects.[89]

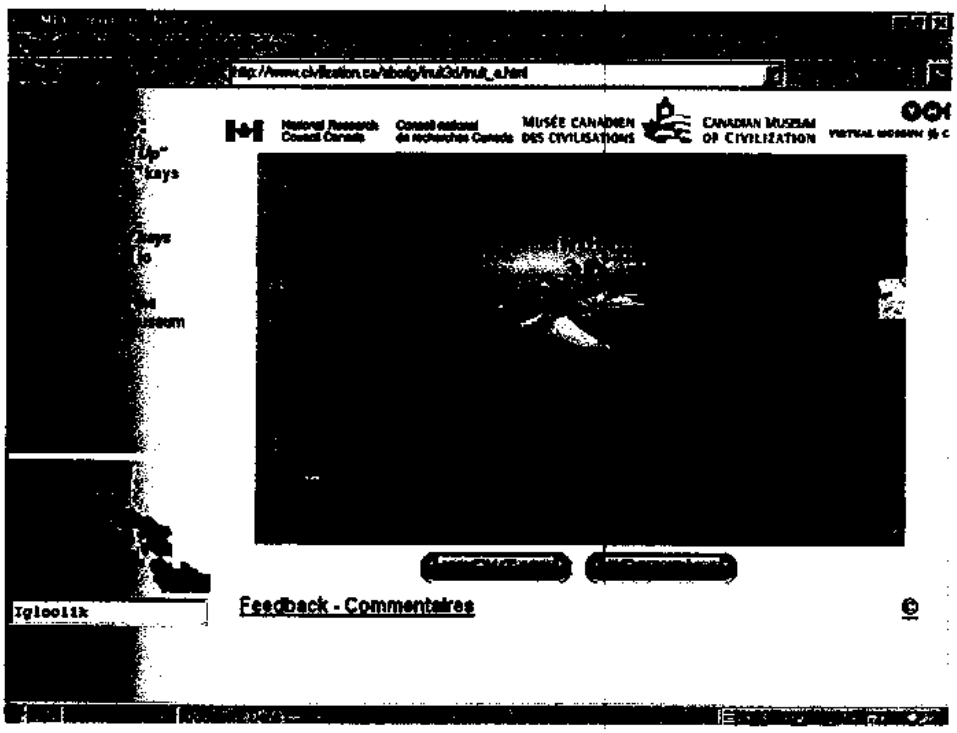

Figure 24. Inuit 3D Exhibition on Virtual Museum of Canada website

These two projects go far beyond putting collection records online. They fabricate exhibitions based on information they extract from objects and sites. They explore the curiosity of their objects, the mystery of science. In the instance of reconstructing objects and architecture that

The Minneapolis Museum of Art's online exhibition *Modernism* leads visitors through an attractive interactive presentation of shallow links. The opening screen of *Modernism* displays the word as shown on top of the picture (Figure 25). Each letter of the word Modernism, links to a designated time period and movement. Categorical choices presented to visitors throughout the website help them find the information they want to find. Options at the bottom of the screen enable users to change directions at any point. The *Movies* option (Figure 26) lets visitors see videos about collection objects and artists that they would never have an opportunity to see anywhere else except perhaps in the museum itself. The 360° selection lets the user turn a photographic image of the object with their mouse to see it from the angle they choose. For users who may never have the opportunity to go to this museum this kind of presentation provides them with much more than a basic database.

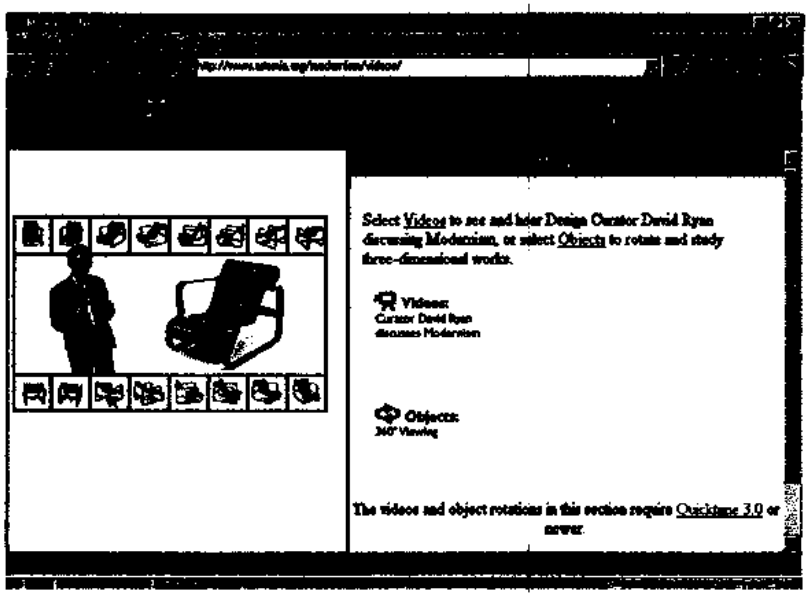

Figure 26. Options in Minneapolis Museum of Art's Online Exhibition *Modernism*

Another online exhibit at the Minneapolis Museum of Art entitled *The Arts of Asia* takes two directions. The opening screen prompts users to select one of the two paths. One path is the *Art of Japan* and the other path takes an in-depth look at one collection object, *Yamantank Mandala.*

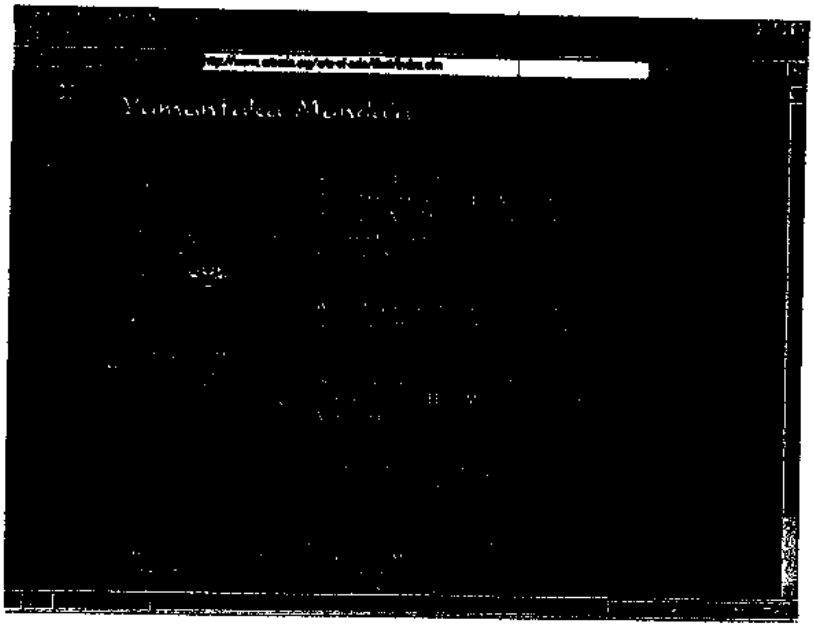

Figure 27. Minneapolis Museum of Art online exhibition dedicated to one object the *Yamantaka Mandala*

The above image (Figure 27) is the opening screen of *Yamantank Mandala.* The screen contains several hyperlinks; each examines the object from different perspective, specifically "exploring, creating, preserving, and teaching." Like most images we have seen on museum web pages the image of the object, here the *Yamantanka Mandala*, can be enlarged by clicking on it. Other links use multimedia to create several ways of seeing the object. Michael Douma, of the Institute for Dynamic Educational Advancement, writes

> "We find that visitors respond very favorably to exhibits that offer a lot of guidance judiciously mixed with easy navigation." ... "Despite the advances[in interactive capabilities], however, it is our experience that the most important quality in an exhibit (besides content) is ease of navigation. Attention to content and organization is more important than 'cool graphics,' and certainly more important than any animations or sounds. Visitors must immediately perceive the conceptual structure of the exhibit: what is available, and where information is located. Today's web users are more likely to follow links if they can anticipate exactly what a link will bring."[90]

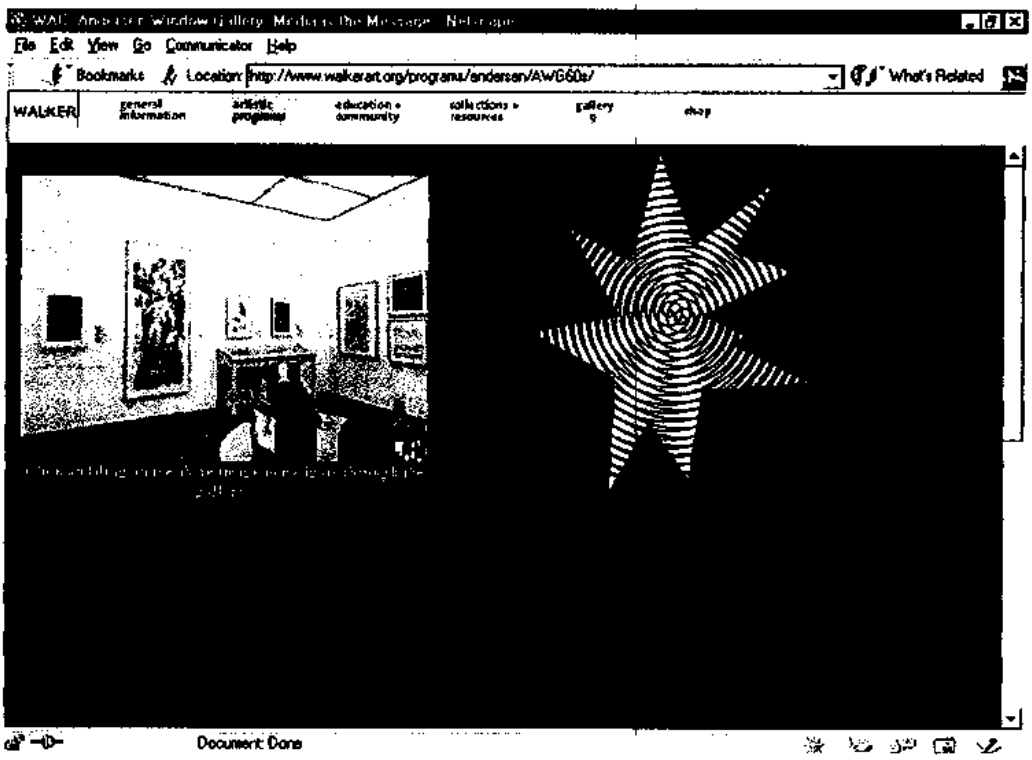

Figure 28. Walker Art Center 's online exhibition *Media is the Message* makes use of panning technology to explore the gallery space.

Online exhibitions at the Walker Art Center (also in Minneapolis) use the gallery itself as metaphor for the website design. The site's *Andersen Window* uses a plug-in to let visitors see the actual exhibit. Patient visitors who are willing to wait a minute or two will get to play with the virtual gallery depicted in the image's upper left-hand corner. Simple directions tell the user what to do and how to manipulate the image to pan the gallery space as if being in it. Each specific work can be selected to be examined more closely. When a user selects a piece, the record appears, which is much like the collection records we have seen, at the other websites. What is different is how the retrieves the record. The user first interacts with the exhibition and then the image of the object. Are the Walker's and the Minneapolis Museum of Art's method of retrieving information any better than the search driven designs used by AMICO, SCRAN, or the AMOL gateway? For the user who knows exactly what they are looking for, maybe not. However, for the user who does not know what

they want, these two sites offer options. Both the Minneapolis Museum of Art and the Walker Art Center have search engines as well. Their online exhibitions are yet another option for users. They offer an entertaining way to explore museum collections.

The San Francisco Museum of Art Website allows users to search collections, view past and present online exhibitions, and participate in programming to learn, comprehend, and reflect upon their permanent collection. One of the programs offered is *Making Sense of Modern Art.* As the title suggests this interactive web production is more than a glance at collection records. The program uses permanent collection records and multimedia authoring to educate visitors.

Motivated by a desire to use the interactive program as a tool for "discovery," project designers wanted to surpass what they characterized as "standard book-like or template based design."[91] The program is designed to be content driven, not database driven. It is also designed to be flexible. It has three main modules, within each is a nonhierarchical structure that enables users to investigate and learn about Modern Art through the museum's collection. The three main modules: *Timeline, Themes,* and *Contexts* each approach Modern Art in a unique way.

The *Timeline* encourages users to select a collection object from thumbnail images on a timeline. The program then presents the user with several related works. Users may choose any or of the related works to explore the connections between the two pieces. The screen displayed in Figure 29 shows how users can compare two works selected from the *Timeline.*

Throughout the program, screen designs facilitate access to several different ways of interpreting works by selecting the small red triangles. Clicking the triangles triggers the opening of a small box that reveals additional information about the specific works such as size, medium, and donor.

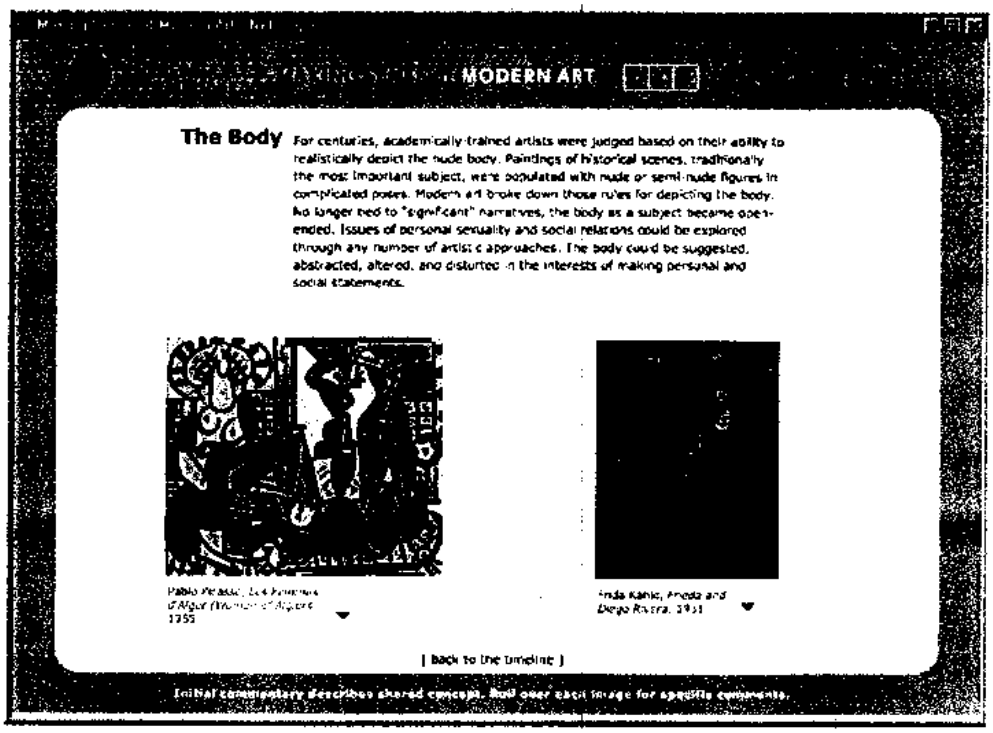

Figure 29. Timeline Art Comparison in *Making Sense of Modern Art* Educational Program on San Francisco Museum of Modern Art Website.

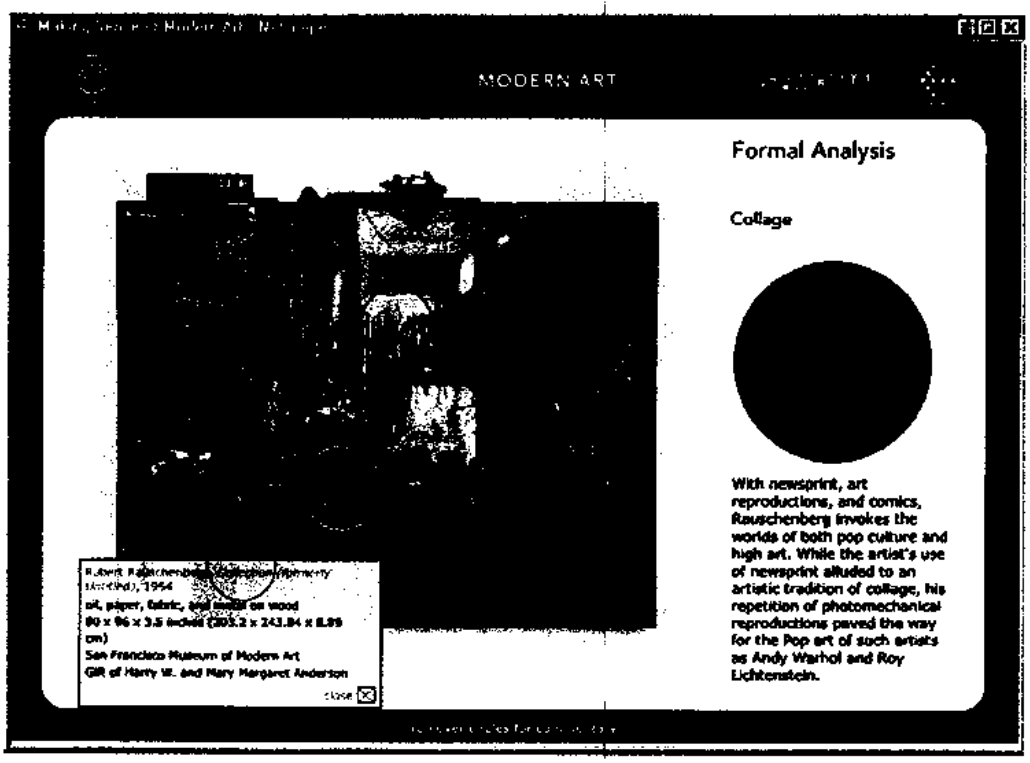

Figure 30. Exploration Page in *Making Sense of Modern Art* Educational Program on San Francisco Museum of Modern Art Website.

The *Contexts* module presents users with several works and avenues for exploring particular artists and their work. When a work is selected, a hyperlink to an artist page is activated; one of which is Robert Rauschenberg. The Rauschenberg screen connects to several specific works and interprets them in different ways. The screen shot shown in Figure 30 examines the Rauchenberg's use of collage. The event driven page displays different text when the user rolls over the circled areas on the work of art. Each area examines a significant point in Rauschenberg's technique, this offers the user an opportunity to see details of the work, learn about his art making process as well as understand why his work is significant.

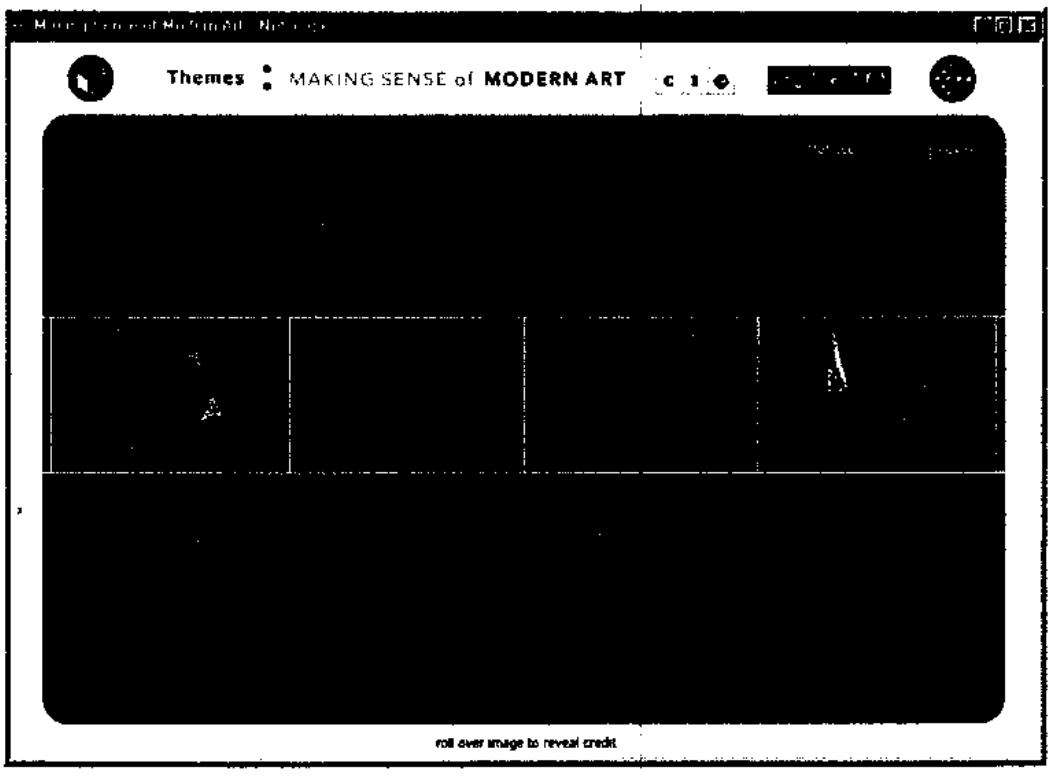

Figure 31. A Theme Page from *Making Sense of Modern Art* educational program on the San Francisco Museum of Modern Art Web Site

The third module, *Themes*, examines *The Evolving Role of Style* as dominant determinant of modern art. The screen shown in Figure 31 looks at style through the work of artist Gerhard Richter. Other pages in the module examine style in the works of Matisse and Sherri Levine. As in previous

screens, the red triangles allow users to hyperlink to different images without leaving the page they are.

Making Sense of Modern Art was designed to be used online, in the gallery and as a CD ROM.[92] The version currently available online is designed to be flexible enough so that more screens may be added as they are developed. The project is planned to add more content as it can be authored. Designers created a "Wizard" tool for curators to expedite the authoring process. In terms of interactivity between the user and the content material, The overall state of the project is in stage three of a five-step approach to achieving online interactivity. San Francisco Museum of Modern Art representatives Peter Samis, and Susie Wise explain the museum's identification of five levels of interactivity as phases the museum is planning to attain in their programming.[93] Their different levels of interactivity ratings build from a sequential or indexed navigation for hypermedia in level one to the ultimate goal of level five where the user can "co-author" the program.[94] Level five interactivity takes full advantage of the web medium's ability to gather information as well as distribute it. Designers categorize *Making Sense of Modern Art* as level 3, meaning it enables users to use the multimedia format to follow the process for themselves and discover content materials by navigating on their own path.[95]

The San Francisco Museum of art may not be unique in its ultimate ambition to permit users to annotate and co-author website content materials. It is an exciting idea for people who want to have a place to express their ideas about art. For the purpose of this thesis, *Designing Museum Websites for Collection Records,* websites permitting visitors to annotate, edit, and co-author collection objects records suggest a redefinition of what a museum collection record is. In an art museum, is random interpretive opinion a valid ingredient for a collection record? Is visitor input as relevant to an object record as the curator's scholarly viewpoint. It seems unlikely that personal

accounts associated with art objects would be something a museum wants to collect as part of an object record. It seems far more appropriate for another forum, such as a chat room, which the San Francisco Museum of Art does maintain on its site. History and commemorative museums like *The American Family History Center,* at Ellis Island seem to be more appropriate venues for visitor's co-authorship. Objects and oral reminiscence add to the human drama those institutions aspire to preserve. For the purposes of this paper, I was unable to find an example of a website that permits users to contribute to collection records.

Data Cubes and Data Mining to Interpret Collections

Garrett Dworman, Steven Kimbrough, and Chuck Patch explain how data mining can be used to find patterns within the database of collection records.[96] The paper explains how data mining systems structure data in a cube, called an Online Analytical Processing (OLAP) cube. The system sets up many tables layered together to form a three-dimensional cube rather than a flat two-dimensional table. The data cube "slices and dices" the information held in it by looking at it from different angles. A researcher wanting to find patterns within the collection, for example a 19th century painting collection would be able to find patterns in the collection without retrieving information about specific paintings. They would theoretically retrieve information about the relationships within the collection as a whole. For example, perhaps a researcher wanted to know:

> During the 19th century, what locales produced more Impressionist paintings?
>
> What is the relationship between a painter's materials and their place of residence?
>
> What kinds of subject matter were collected by the museum during what period of time?
>
> Is there a pattern associated with a painting's age and conservation?

These questions might only interest museum staff or other experts but data mining provides the power to examine documents, relational databases, and in theory, images as well. The point of data mining is to ease the user's ability to extract the information. The cross tabulation ability takes the fielded answers and restructures the information to give numeric results.

Both online and in-house collection management systems use relational databases to retrieve fielded data. The architecture of the database builds a table structure to hold information. Most applications do not show the user the table but it is there, behind the scenes keeping track of the information. For example, if the user enters a query in the following fields:

Object	**Painting**
Medium	**Oil**
National Origin	**France**
Century	**19th**

The following table shows retrieved data, imagine that it retrieved 50 or 100 hits rather that the four depicted. The hypothetical table shows the artist's birth date, residence, choice of painting support, and subject matter. It reports data about specific paintings. The table cannot cross tabulate the information that it holds, it can only read in straight lines and it does not total any information. It offers no conclusion s about the relationship between objects. As the number of rows and columns expand on the table, it becomes more and more difficult to analyze the group records returned. If a researcher wanted to answer questions about the museum's collection of 19th century paintings they would have to study the table themselves to get results.

Accession Number	1950-144	1996-7	1972-575	1895-64
Object	Painting	Painting	Painting	Painting
Medium	Oil	Oil	Oil	Oil
National Origin	France	France	France	France
Century	19th	19th	19th	19th
Artist	Corot, Jean-Baptist - Camille	Courbet, Gustave	Renoir, Pierre Auguste	Seurat, Georges
Artist place of birth	Paris	Ornans	Limoges	Paris
Artist date of birth	1796	1819	1841	1859
Artist date of death	1875	1877	1919	1891
Artist place of death	Paris	Tour de Pietz	Cagnes	Paris
Title	Ville d' Avray	Bonjour, Monsieur Courbet	Ball at the Moulin de la Galette	Sunday Afternoon on the Island of Grande Jatte
Date	ca. 1867 - 70	1854	1876	1884-6
Size	49 x 65 cm.	129 x 149 cm	78 x 114 cm.	202 x 300 cm.

Imagine the same table held more fields of information in Column 1. Imagine the above table included additional fields for:

Medium Support
Subject Matter
Description
Technique
Style or Movement
Artist Place of Residence
Provenance
Credit Line

The power of cross-tabulation databases in museum collections is yet to be realized. Dworman, Kimbrough, and Patch discussed two prototypes, is one model with two distinct parts in use at the New Orleans Historical Society. Photographs by Clarence John Laughlin make up a significant part of the collection. The central component of the cross-tabulation databases called, the *Core of Discovery,* indexes written explanations of photographs by Laughlin.[97] The slice and dice part of the system, *Homer,* cross-tabulates the *Core of Discovery* system. Though not yet available online the prototype *Homer* searches through text contained in Laughlin's commentary to find relationships among the photographs.

The complicated nature of data mining makes it difficult to understand. On the surface, it seems evident that data mining has only applications for experts. Never having interacted with an OLAP system, I can only counter that argument with my own experience. Perhaps as a graduate student I would have had more use for data mining than I had for AMICO. Using AMICO proved extremely difficult when I was trying to retrieve information about paintings produced after 1945. I was for example, trying to retrieve Realist American Paintings in the hopes of finding works not available in print. I was looking for batches within the database of objects that met specific criteria. I was trying to use the database as a tool but to my own frustration, I never had success. A data cube may have been able to find the information I needed. I can only speculate that data mining seems to be a more appropriate technology for such a request.

AN EXPERT SYSTEM

Britt Kroepelian describes a database system for experts called the Expert System for Norwegian Silver. The main function of the database is "capturing and recording the knowledge of

the connoisseur."[98] The system isolates three areas of silver tankard design, "proportions, shape, and ornamentation"[99] that distinguish them from those of other times. The program operates by what is called adaptive or intelligent technology. The database is a "semantic network."[100] The system responds according to the user's answers to questions about "specific stylistic features." Designed in collaboration between Michigan State University's Computer Science Department, under the supervision of Dr. Anil K. Jain and Norwegian silver connoisseurs Thorvald Krohn-Hansen, Robert Kloster, and Jorunn Fossberg, the program guides the user through a process to identify silver. If the user answers a question one way, the database is programmed to provide them with another series of questions. The process begins as a classification system and although it can not teach the user the data it stores, it does teach them how to look at the object to discover its origin.

The expert system is what every guest on the *Antique Road Show* wants. Is it a master tool, that almost anyone can use? Is it connoisseurship for dummies? If only it included an appraisal module. But what do users want to know? An expert system seems to appeal to those users who are interested in the authenticity and commodification of objects. It is not about Norwegian history or culture, just about silver tankards, and silver makers' marks. The expert system makes an assumption, that experts already know background information. If the system was 'connoisseurship for dummies' it would need to include background information pertaining to the object's the creator, and its social, cultural, or political importance. We have seen in SCRAN how a database can provide fragments of information regarding these things but is that what makes using the medium appealing to users? Do website visitors want to use databases in the privacy of their own homes during their leisure time? Do they want to go on wild goose chases through endless trails of hyperlinks? Or do they want something else? Do they want something programmed, more like television or a video game?

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SECTION III

Understanding the Legal Issues

"The primary obstacle to art museums online is not technological but legal."[101]

- Maxwell Anderson, in "The Byte-Sized Collections of Art Museums."

Currently, laws concerning copyright infringement, licensing, liability, trade secret, decency, and privacy are being reviewed and reformed internationally because of the internet. Legalities put museums on both sides of the law as copyright holders and as potential infringers. As electronic records are being defined legally, museums need to be aware of the issues. Several copyright cases in recent years have challenged the courts to define fair use in relation to object surrogates such as photographs and digital images. In recent years, case law has been questioning the gray area between original work of art and reproduction. Technology will most certainly challenge courts to redefine fair use and copyright ownership in the coming years. A New York Court ruling in the Bridgeman Art Library v. Corel Corporation case demonstrated to museums that they have cause to be concerned about works whose rights are now public domain.[102] The court found that a photograph of an artwork is not an original work deserving of copyright protection. In other words, copyrights are not automatically reborn by photographic reproduction, the derivative work must possess original qualities created in the process of the photography. However another recent case Kelly v. Arriba Software Corporation (also referred to as Ditto in case documentation), the court ruled that although Arriba infringed on Kelly's exclusive copyright, it was not liable. Arriba's unlicensed use of thumbnail images of Kelly's work transformed it, therefore it was exempt from liability.[103] The internet empowers users to reproduce and transmit web page content instantaneously. As owners of intellectual property

museums are vulnerable to copyright infringement. Museums need to guard images on websites. Digital watermarking is becoming the standard operating procedure to protect intellectual property. Museums offering high-resolution images on the internet are inviting users to use those images. Digital watermarks are not foolproof and however "robust, they do not prove ownership."[104] The Museum Educational Licensing Project (MESL) and the Conference on Fair Use (CONFU) developed strategies for managing intellectual property to guide museums. Licensing agreements modeled after MESL should be reviewed in consideration of new case law rulings in the post MESL years. Organizations such as the Electronic Frontier Foundation monitor current and pending copyright legislation.

AMICO has had to negotiate permits to college end users that are hesitant to commit to strict licenses prohibiting the local use of images.[105] Museums providing content for the AMICO database must secure their own copyright licenses. Simply owning an object does not grant the title holder copyright ownership. Current proposals being recommended by the Digital Future Coalition to amend the NII Copyright Protection Act will directly impact electronic records and digital images on the web. The proposals concern distance education, privacy, and the preservation of "Heritage Works."[106] While laws are still being amended, the licensing and security offered by AMICO may be the best solution for many museums.

Museums must understand clearly that they are granting rights when subscribing to an AMICO like library or internet service provider. What risks are museums taking by permitting third parties access to high-resolution images? Who owns the rights to the electronic records while housed in the server? Who owns the rights once the subscription expires? Licensing agreements may have to be negotiated for what in the past were routine documentation practices.

Museums as rights holders to intellectual property have to safeguard objects in their collection. They must guard their financial interest in the collection by preventing any

opportunities for piracy. The copyrights of collection objects do not always belong to the museum. In publishing works to which they do not own the rights, museums may be held vicariously liable for facilitating copyright infringement. As rights holders and as the stewards of museum objects precautions must be made to protect digital images online from piracy. Public notification of copyright ownership, licensing, and artist's rights if not displayed directly on web pages with the digital image must be included as hyperlinks on museum sites. Figure 33 demonstrates a login screen in which users must agree to terms before they are permitted to browse the collection database of the Seattle Art Museum.

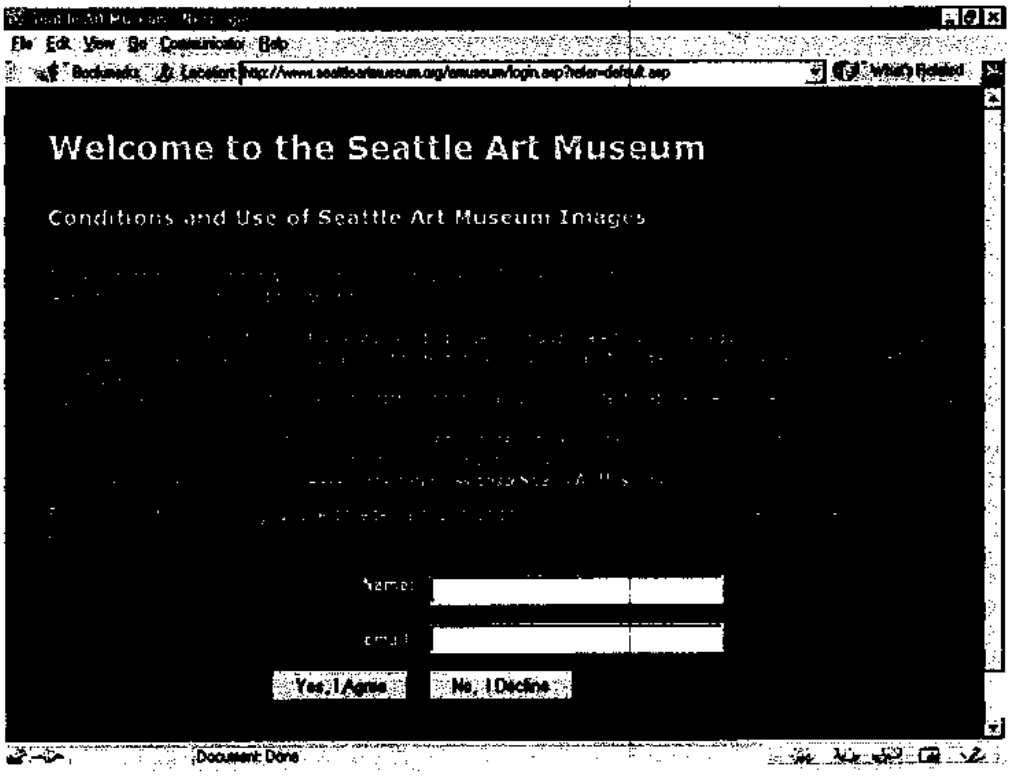

Figure 33. Seattle Museum of Art login page

Copyright protection for databases is perhaps more vague than it is for other kinds of publication. Non-exclusive agreements may need to contain clauses to protect a museum's right to preserve digital art and electronic records. Museums may have to investigate the trade secret law to protect their databases. Trade secret protection extends to intellectual property that is

compiled by the owner and has value.[107] Confidentiality does play a significant part in trade secret protection. Public access to a collections database may undo trade secret protection. Would it be possible for someone to download a large catalog list and images from a museum web site? Could a clever employee secretly copy the database? If the catalog was republished in another form, could the trade secret law protect the museum's interests? What is the potential for harm?

When publishing an image online copyright protection grants a bundle of rights to the copyright owner. What is the scope of copyright in relation to the ownership of an online database? Copyright applies to original content but a database is a compilation of facts. Does a museum own the facts entered into a database? Legally, what is a database? What is an electronic record? Do we really need to define these terms? Considering the legal, ethical, and custodial responsibilities of the museum collections database, the answer is most certainly, yes! Archivists are making distinctions between records and data/information, defining a record as "evidence of transactions" that must be 'set aside' in the course of business to be considered a record."[108] This implies that only the electronic records regarding museum object transactions are protected. Computer technology has enabled the creation of electronic transactions that may never be documented on paper, thus creating electronic records. In the United States, electronic records are protected by the Electronic Freedom of Information Act.[109]

Although automated records and data are both constructed from digital metadata, a collections database may not be entirely defined as records. Databases are facts that have been "set aside" and stored in a digital format. At this time databases are not protected by copyright in the United States.[110] The design of a database may be protected but the facts contained are not. The Supreme Court ruled that piracy of factual information is not a crime in Feist Publications Inc. v. Rural Telephone Services Company (499 U.S. 340, 349 (1991)).[111] In this case, the Rural

Telephone Services Company simply copied the Feist Publications telephone book. Feist's attorney claimed the labor of compiling the phone book should be protected by copyright. The court ruled that the "sweat of the brow"[112] does not constitute an original creative act for the culling of facts, and therefore is not protected by copyright. The Database Investment and Intellectual Property Antipiracy Act of 1996 has not been sufficiently tested in the courts to overthrow the Feist case. Until it is, the Feist precedent stands. How either legality will influence museum database protection case law is uncertain.

Museums as institutions in the not for profit service of the public have to tread carefully to serve the public by providing access to their collection records. The uncertain nature of the legal standing of electronic media and publication makes museums vulnerable to increasing liability as potential copyright infringers. What are the rights of museums to reproduce images for their own documentation purposes? What is the extent of their rights to document their collection with digital images? Several legal papers suggest that trademark law may offer museums some protection for databases but no legal case firmly establishes a precedent.

The twentieth century has changed how the world documents history. New media beginning with photographs, film, sound recordings, video, and now electronic records have consistently posed preservation dilemmas. As generations pass, museums and archives may find that to preserve the various forms of documentation they must transcribe them in some manner. The idea is not new. Libraries have been transferring journals and newspapers to microfilm and databases for decades. In these forms, the images and the graphic art quality of the original publications are compromised or even lost. For documentation purposes, surrogate images are and will continue to be incorporated into collection databases. As we learn the methods to preserve electronic records, we learn that the need to periodically migrate or emulate those records can not be ignored. Do museum professionals realize that questions of copyright may

arise when they emulate their own database records? Jeff Rothenberg, warns that copyright issues may interfere with the widespread use of emulation to preserve electronic records.[113] Will the imitation of obsolete technology to access an old database be considered fair use or infringement? Rothenberg may be suggesting that a surrogate device, facilitating emulation, may not be an original derivative form of the technology it aspires to preserve. If the database is not protected by copyright wouldn't emulating that database be fair use? If the original program, licensed to the museum to create the database, were emulated, would that constitute misuse of the license?

Issues of decency that prompted the Communications Decency Act in the U.S. in 1997 are now fueling the creation of International Internet Zones. Questions of jurisdiction riddle web communications. Software is now being developed limiting access to regional areas. In 2000, French and German cases upheld censorship of web content by blocking access websites promoting ethnic hatred. Will censorship laws soon restrict museums from displaying art images depicting nudity on websites?

Privacy and the public's right to know are other issues being tested in the international and American courts. Sunshine Laws requiring government funded museums to publish collection information could presumably effect institutions further. In 1992, a Texas Court concluded that the Dallas Museum of Art is a "governmental body" under the Texas Open Records Act.[114] The court stated, "only documents relating to those sections of the museum supported by government funds are public."[115] This implies that all documentation pertaining to those funded projects should be available for public scrutiny. It seems that as soon as one issue is settled in court it is challenged from another angle. Recanting the recent rulings hardly serves a purpose because the laws are evolving annually. Extensive monitoring of these issues is necessary as internet copyright and other law is established and challenged in the years to come.

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106 "Summary of Issues and Proposal to Amend the NII Copyright Protection Act." Retrieved 30 April 1998. *Association of Research Libraries,* Washington DC, http://www.arl.org/info/frn/copy/summary.html

107 Losey. "The Uniform Trade Secrets Act. 14 U.L.A. 541 (1980) Section 1 (4) of the Act defines a trade secret to mean: Information, including a formula, pattern, compilation, program, device, method, technique or process that: a derives independent economic value, actual or potential, not being generally known to, not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and b. is subject of efforts that are reasonable under the circumstances to maintain secrecy." p 7.

108 Bearman, David and Trant, Jennifer. July/Aug 1997. "Electronic Records Research Working Meeting May 28-30, 1997." *D-Lib Magazine* .p. 3. The meeting offers in depth discussion of electronic records.

109 Malaro, Marie C. *A Legal Primer on Managing Museum Collections.* Washington DC: Smithsonian Institution Press. 1998. p. 440.

110 Losey, Ralph C., 4 March 2000. "Practical and Legal Protection of Computer Databases," Electronic Frontier Foundation, *http://www.eff.org/pub/Intellectual-property/database-protection.paper.*

111 Ibid p. 4. 499 U.S. 340, 111 S.ct. 1282, 113 L.Ed.2d. 358 (1991).

112 Ibid.

113 Ibid.

114 Oltrogge, Kymberly. "Dallas Museum of Art/ Governmental Bodies ? Benefactors. " *American Lawyer Newspapers Group, Inc. Texas Lawyer.* 13 April 1992:Weekly Case Summaries p23. § 2(1)(G) of the Texas Open Records Act V.T.C.S. art. 6252-17a

115 Ibid.

CONCLUSION

As communication technology continues to evolve swiftly museums will adapt to new challenges and achieve unprecedented exposure to new audiences. The internet is now a part of how the world communicates, it is a standard mode of interaction. People expect cultural institutions to maintain an interactive website, which at the very least will provide them with basic collection information. To satisfy new communication demands, museums have an obligation to develop electronic documentation, networking, and websites. Keeping pace with current industry standards and new laws will require ongoing attention. There is a danger that the demanding nature of using innovative technologies will drain museum funds and encumber personnel. However, no time is better than now to include an electronic documentation policy and a website proposal in the long-term strategic plan of the museum.

This thesis has shown how museum collection records on both in-house networks and websites attempt to achieve different purposes. But are online records fulfilling those proposed goals? Collection records published on websites rarely communicate why an object is significant. Many website designs incorporate image databases but omit timelines and thematic search criteria. Consequently, if a user does not know exactly what they are searching for they can not find any related works. The practice of limiting online collection records to the fragmented data retrieved from collection management software is not enough. Very often basic interpretive information, a staple in a museum exhibition, is not included on the website. In general, many websites appear as online posters advertising the museum, most seem designed by the marketing department rather than the collections department. If the website serves solely as a promotional ad then why publish collection records? As museums attempt to fulfill missions of education and public access on the internet, websites displaying large numbers of digital images

and collections databases have substantially increased. The online publication of museum collection records should reflect the existing mission of the museum however; the problem lies in the final product, the design of the website. The fine line between mission goals of education and public access blurs on museum websites. Many online databases attempting to achieve both goals but achieve neither. Created as resources of collection information they are just inventory lists of objects. The collection as a whole is lost. The databases rarely include information that would be usable to the public, such as provenance, insurance value, or a bibliographic reference. A phone book is more user-friendly. Educational label copy, so typical in a museum, is conspicuously absent in online collection records. References to style and artists background are simply excluded. The fragmented nature of a database isolates details of an object from both itself and the collection. To combat the incompleteness of fragmentation, museum collection records need to be designed and authored specifically for the web publication.

Due to both financial restrictions and the desire to create cultural resources, partnerships among institutions have produced ambitious internet projects. When museums collaborate with other organizations to compile databases although each contributing museum authors the content it provides, the individually of each institution is lost in the merged database. Each museum expends tremendous energy conforming to technical standards for formatting content material while the entire conceptual design of the compilation database is flawed. The fragmentation resulting from the lack unity (in content material for the compilation database) generates an ineffective and irrelevant resource. Organizers of compilation projects like AMICO (Art Museum Image Consortium) neglect to unify the compiled collection records before distributing them. The shallow designs and lack of connecting threads through compilation database retrieve information that is either too specific or too vague. One thing that is glaringly lacking is cross-museum hyperlinks that integrate the content material of one museum with that of another.

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[redacted]

[redacted]orts to unify compilations are evident in the "Projects" and "Pathfinders" [redacted] SCRAN (Scottish Cultural Access Network) but they fail to focus material [redacted] Search results retrieved from "Projects" and "Pathfinders" are indexed by [redacted] hunt through an abundance of entries to find relevant records. The [redacted] through search results is more time consuming and less rewarding than using a [redacted]

Gateways sites hyperlink to individual museums and therefore permit [redacted] control its own website. The advantages of gateways are the fact that they relieve [redacted] of the data preparation requirements, increase exposure to a larger audience [redacted] museum individually. For users however, gateways only expedite the retrieval [redacted] several museums simultaneously. There is no collaboration amongst [redacted] participants to generate a unified online educational resource. In general, collection [redacted] software packages, such as the ARGUS Web Module and The Museum System [redacted] when used in conjunction with gateways offer museums greater individual [redacted] compilation databases. All three strategies, compilation databases, gateways and [redacted] management software can easily become a fragmented apparatus on which to [redacted] collection records online.

Online exhibitions as demonstrated on the Minneapolis Museum of Art [redacted] Francisco Museum of Modern Art effectively merge multimedia technology [redacted] properties. Both websites organize collection records around a central theme [redacted]

Efforts to unify compilations are evident in the "Projects" and "Pathfinders" options of the SCRAN (Scottish Cultural Access Network) but they fail to focus material comprehensively as well. Search results retrieved from "Projects" and "Pathfinders" are indexed by keywords. Users must hunt through an abundance of entries to find relevant records. The process of weeding through search results is more time consuming and less rewarding than using an encyclopedia.

Gateways sites hyperlink to individual museums and therefore permit each museum to control its own website. The advantages of gateways are the fact that they relieve museums from some of the data preparation requirements, increase exposure to a larger audience, and highlight each museum individually. For users however, gateways only expedite the retrievable of queries from several museums simultaneously. There is no collaboration amongst the gateway participants to generate a unified online educational resource. In general, collection management software packages, such as the ARGUS Web Module and The Museum System's *eMuseum*™ when used in conjunction with gateways offer museums greater individual control than compilation databases. All three strategies, compilation databases, gateways, and collection management software can easily become a fragmented apparatus on which to present museum collection records online.

Online exhibitions as demonstrated on the Minneapolis Museum of Art and the San Francisco Museum of Modern Art effectively merge multimedia technology, information, and aesthetics. Both websites organize collection records around a central theme. Each topic presented on the website is designed in concise sequential patterns yet permit the user to divert the sequence if they so chose. Collection records are presented with interpretive information in an instructional manner. Multimedia elements, are intermingled in the online exhibition and are accessible through hyperlinks. Video and sound clips supplement the online exhibition and use internet as a venue for presenting media that is not accessible in any other public forum outside

the museum. New technology in data mining and adaptive systems such as the *Expert System for Norwegian Silver,* adjust to individual users, offer a promising alternative to interpreting collections online. Hopefully museum website developers will realize the potential and use this technology, which is also termed intelligent labeling, on museum websites featuring collection records.

Websites have idiosyncrasies and limitations. The beauty lines in the speed of hyper-linking information as well as its ability to incorporate images and multimedia. On the other hand, ongoing expense of maintaining electronic records and potential legal entanglements stemming particularly from copyright infringement, complicate and discourage museums from publishing online independently. Therefore, many institutions rely upon collaborative partnership to establish a web presence for collection records and in doing so sacrifice their own unique identity. Critical study of museum websites is a valuable exercise to prepare for the design of a museum website incorporating collection records. Many sites are transforming collection management records to effective internet exhibitions fulfilling both roles of education and public access. Most importantly specific goals for websites need to be determined. Collection management software simplifies the transfer of collection records to the internet however, supplemental interpretive information needs to be authored and linked to the records. The process begins with good practice in the electronic documentation of collection objects proceeds to curatorial authorship, and can be culminated by the incorporation of multimedia. To take full advantage of the capability of the internet, information can be gathered from users as well. In any case, museum website design for collection records is not a job for the marketing director, publications staff, or a web master alone. Essential collections staff members should participate in prioritizing and establishing procedures for both the electronic documentation of collection objects as well as the online publication of records for specific target audiences.

GLOSSARY

applet "1) A small to medium sized computer program that provides a specific function, such as emulating a calculator. 2) In Java, a mini-program embedded in a Web document that, when downloaded is executed by the browser."[1]

architecture "The overall conceptual design of a hardware device or computer network that specifies how its various components interact."[2]

application "A program that enables you to do something useful with the computer, such as writing or accounting as opposed to utilities programs that help to maintain the computer."[3]

architecture "The overall conceptual design of a hardware device or computer network that specifies how its various components interact."[4]

CPU Central processing unit. Also called a Server.

cross-tabulate "To analyze and summarize data."[5]

data dictionary "A database about data and databases. It holds the name, type, range of values, sources and authorization for access for each data element in the organization's files and databases. It also indicates which application programs use that data so that when a change in a data structure is contemplated, a list of affected programs can be generated. The data dictionary maybe a stand alone system or an integral part of the DBMS. Data integrity and accuracy is better ensured in the latter case."[6]

data mining "Exploring detailed business transactions. It implies 'digging through tons of data' to uncover patterns and relationships contained within the business activity and history. Data mining can be done manually by 'slicing and dicing' the data until the pattern becomes obvious. Or it can be done with programs that analyze the data automatically."[7]

database "A set of related files that is created and managed by a database management system (DBMS). Today, DBMSs can mange any form of data including text, images, sound, and video. Database and file structures are always determined by software. As far as the hardware is concerned its all bits and bytes."[8]

DBMS "A set of related files that is created and managed by a database management system (DBMS). Today, DBMSs can mange any form of data including text, images, sound, and video. Database and file structures are always determined by software. As far as the hardware is concerned its all bits and bytes.[9]

delimiter "A character or combination of characters used to separate one item or set of data from another..."[10]

domain "1) In a LAN, a sub-network comprised of a group of clients and servers under the control of one security database. Dividing LANs into domains improves performance and security. 2) In a communications network, all resources under the control of a single computer. 3) On the Internet- a registration category..."[11]

GLOSSARY

event driven environment	"A program or operating system that normally functions in an idle loop, waiting for events, such as a mouse click, keyboard input, or a message from a device to occur. When the event occurs, the program exits the idle loop and executes the program code designed to handle the event, the program returns to the idle loop."[12]
field	"A physical unit of data that is 1 or more bytes in size. A collection of fields make a record."[13]
file	"A collection of bytes stored as an individual entry."[14]
hypermedia	"The use of data, text, graphics, video, and voice elements in a hypertext system. All various forms of information are linked together so that the user can easily move from one to another."[15]
interface	"The connection and interaction between hardware, software, and the user."..."User interfaces are keyboards, mice, commands, and menus used for communication between you and the computer."[16]
kiosk	"A small self-standing structure such as a newsstand or ticket booth. Unattended multimedia kiosks dispense public information via computer screens. Either a keyboard, touch screen or both are used for input."[17]
mapping	"The process of converting data encoded in one format to another format. In database management, for example, the database index provides a way of mapping the actual records (which are all sorted on disk in a fixed order) to the display screen in useful ways. 2. In LAN, mapping refers to assigning drive letters to specific volumes and directories."[18]
metadata	"Data that describes other data. Data dictionaries and repositories are examples of metadata. The meta tag that describes the content of a Web page is called metadata. The term any also refer to any file or database that holds information about another database's structure,, attributes, processing, or changes."[19]
metaphor	"The derivation of metaphor means to 'carry over'. Thus the 'desktop metaphor' as so often described means that the office desktop has been brought over and simulated on computers."[20]
navigate	"'Surfing the web' to move from page to page."[21]
network	"1) An arrangement of objects that are interconnected. See LAN and network database. 2) In communications, the transmission channels interconnecting all client and server stations as well as all supporting hardware and software."[22]
ODBC- Open Database Connectivity	"A database programming interface with Microsoft that provides a common language for Windows applications to access databases on a network..."[23]
OLAP cube	"A multidimensional database that holds data more like a three dimensional spread sheet rather than a relational database. The cube allows different views of the data to be quickly displayed."[24]

GLOSSARY

parameter	"Any value passed to a program by a user or by another program in order to customize the program for a particular purpose."[25]
plug-In	"An auxiliary program that works with a major software package to enhance its capability. For example, plug-ins are widely used on image editing programs such as PhotoShop to a filter for some special effect. Plug-ins are added to Web Browsers such as Netscape to enable them to support new types of content (audio, video, etc.)" [26]
protocol	"In data communications and networking, a standard that specifies the format of data as well as the rules to be followed. Networks could not be easily or efficiently designed or maintained without protocols; a protocol specifies how programs prepare data so that it can be sent on t the next stage in the communication process. For example, e-mail programs prepare messages so that they conform to prevailing Internet mail standards, which are recognized by every program that is involved in the transmission of mail over the network."[27]
pull technology	"Specifically requesting information from a particular source. Downloading Web pages with a Web Browser ins an example of pull technology."[28]
push technology	"In the Internet, a series of new content delivery mechanisms, in which users subscribe to what amounts to a broadcasting service, which subsequently delivers content to the user's computer without the user having to make further requests for information."[29]
record	"A group of related fields that store data about a subject of activity."[30]
relational database management	"An approach to database management, employed by Microsoft Access and other database management programs, in which data that's stored in two dimensional tables of columns and rows can be related if the tables have a common column or field. The term 'relational' suggests the ability of this type of database software to relate two tables on the basis of this common field and to construct a new third table based on that relation."[31]
script	"A series of instructions, similar to a macro and typed in plain text, that tells a program how to perform a specific procedure, such as logging on to an e-mail system. Some programs have built in script capabilities."[32]
SGML Standard Generalized Markup Language	"A means of describing a markup language like html of a document type definition (DTD) which defines the elements of a specific type of document and the tags can be used to display these elements with distinctive formats. A program called a parser is needed to read the tags and display the text appropriately."[33]
slice and dice	Refers to rearranging data so it can be viewed from different perspectives. The term is typically used with OLAP databases that present information to the user in the form of multidimensional cubes similar to three dimensional spread sheets."[34]
SQL - Structured Query Language	"... a language used to interrogate and process data in a relational database."[35]

GLOSSARY

stream	"A continuous flow of data through a channel in contrast to data delivery by means of packets."[36]

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1 Pfaffenberger, Ph. D., Bryan. 1999. *Webster's New World Dictionary of Computer Terms.* New York, NY: Simon & Schuster, Inc. p. 31.

2 Ibid. Pfaffenberger. p. 34.

3 Ibid. Pfaffenberger p. 32.

4 Ibid. Pfaffenberger p. 34.

5 Ibid. Freedman Alan. 1999. *The Computer Desktop Encyclopedia.* New York, NY:AMACOM, American Management Association. p. 189.

6 Ibid. Freedman. p. 758.

7 Ibid. Freedman. p. 211.

8 Ibid. Freedman. p. 202.

9 Ibid. Freedman. p202.

10 Ibid. Freedman p 226.

11 Ibid. Freedman p 260.

12 Ibid. Pfaffenberger p.188.

13 Ibid. Freedman. p. 332.

14 Ibid. Freedman. p. 333.

15 Ibid. Freedman. p. 430.

16 Ibid. Freedman.p. 458.

17 Ibid. Freedman. p. 496.

18 Ibid. Pfaffenberger, p. 322.

19 Ibid. Freedman. p. 562.

20 Ibid. Freedman. p. 563.

21 Ibid. Freedman. p. 605.

22 Ibid. Freedman. p. 614.

23 Ibid. Freedman. p. 637.

24 Ibid. Freedman. p. 641.

25 Ibid. Freedman. p. 670.

26 Ibid. Freedman. p. 707.

27 Ibid. Pfaffenberger, p. 434.

28 Ibid. Freedman p. 741.

29 Ibid. Pfaffenberger. p.440.

30 Ibid. Freedman. p. 758.

31 Ibid. Pfaffenberger, Ph. D., p. 453.

32 Ibid. Pfaffenberger. p. 472.

33 Ibid. Pfaffenberger p. 846.

34 Freedman Alan. *The Computer Desktop Encyclopedia.* New York, NY:AMACOM, American Management Association. 1999.p820

35 Ibid. Freedman. p. 846.

36 Ibid. Pfaffenberger. p. 506.

DOCUMENTATION TOOLS

AITF SGML DTD	An Art Information Task Force mark up language for information systems. The references serve as a guide to define scholarly art information not collections management information. The language provides tools to "map" already existing databases to Categories for the Description of Art History;[1] To accomplish mapping, the tool searches for common factors of an existing database to find a level for data interchange between two databases.
Art and Architecture Thesaurus	A Getty Institute Publication. An Art Reference tools available to standardize the data creation phase of automation. Most of the references are available on the web and as books.
Art Information Task Force AITF	The Getty Center and the College Art Association have taken a leadership role in the United States for creating the Art Information Standards and Reference tools.
Bibliography of Controlled Vocabulary Sources	An AITF standard for information systems, include three resources. The references serve as a guide to define scholarly art information not collections management information. Covers management standards for the database including procedures, conventions, syntax, and standards for the content to be entered into the database by the cataloguer
Categories for the Description of Art History	An AITF standard for information systems, include three resources. The references serve as a guide to define scholarly art information not collections management information. Focuses on "data structure" and "data content;"[2] which is basically the organization of record within the database. It is similar to an outline or hierarchy of fields. It also establishes terminology for those fields and a catalog record template.
Dublin Core	Developed in a series of workshops run by the Online Computer Library Center & the Coalition for Networked Information.[3] The Dublin Core is one of the first attempts to develop an universal metadata categories for online sharing of art information.
Getty Thesaurus of Geographical Names	Organizes places from very broad terms, such as Asia, to very site specific. The 900,000 entries include descriptive notes that detail political and physical features as well as longitude and latitude.[4]
ICONCLASS	"A subject specific international classification system for iconographic research and the documentation of images. It was developed by Henri van de Waal (1910-1972), Professor of Art History as the University of Leiden, and competed by his staff. It is a collection of ready-made definitions of objects, persons, events, situations and abstract ideas that can be subject of an image. It organizes iconography into 10 'main divisions' in which the definitions are ordered hierarchically."[5]
Museum Documentation Association MDA	In the United Kingdom the Museum Documentation Association, an organization dedicated to creating universal tools for art documentation and information sharing.
MODES	In the United Kingdom, a software program developed by the MDA, now no longer in production.

DOCUMENTATION TOOLS

Object ID	A Getty Institute Publication. An Art Reference tools available to standardize the data creation phase of automation. Most of the references are available on the web and as books. The FBI is now using one of their electronic tools.[6] "ObjectID" creates a unique dossier for every work of art included in it. James Bower, head of Institutional Relations for the Getty Institute says the database brings together law enforcement and accurate documentation.[7] The precise description of artwork is essential to recover stolen works. Other databases such as the Art Loss Database are aiding museums as well as others combat theft.
Provenance Index	A Getty Institute Publication. An Art Reference tool available to research the ownership history of individual art objects.
SPECTRUM	A standard for documentation used in the United Kingdom
United List of Artists Names ULAN	A Getty Institute Publication. An Art Reference tool available to standardize the data creation phase of automation applicable to the proper phrasing and spelling of acclaimed artist's names. Universal consistency of database information guarantees retrieval of that information. Most of the references are available on the web and as books.[8]

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2 Getty Information Institute, College Art Association. Retrieved 7 March 2000. "Categories for Description of Works of Art," *The Getty Center*, http://www.getty.edu/gri/standard/cdwa/INTRO.HTM. p. 3.

3 Blackaby, Jim. 1997. "Building Integrated Museum Information Retrieval Systems: Practical Approaches to Data Organization and Access." In *Museums and the Web 97: Selected Papers*, David Bearman and Jennifer Trant, ed. Archives and Museum Informatics, Pittsburgh, Pa. p 215.

4 "News from the Getty Information Institute," 1998. *Visual Resources*, v XIV, no 2: 189-91.

5 *"What is ICONCLASS?"* Retreived18 January 2001.http://www.iconclass.nl/texts/icsys.htm 18 January 2001.

6 von Hoffman, Nicholas, October 1998. "Art and Technology at the Getty." *Architectural Digest*, v 55, no. 10: 126+p128.

7 Ibid. von Hoffman.

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