SUMMARY
◆ Reports the results of an observational study of museum exhibit design
◆ Suggests eight communication practices from museum exhibit design that could be transferred to information design for the Web

Modeling Information for Three-dimensional Space:
Lessons Learned from Museum Exhibit Design

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Perhaps these concerns sound familiar:

◆ Visitors complain that they cannot find information of interest. One observes, "I know there's information about that type of robotics here, but darned if I can find it."

◆ Visitors enter the site but don't stay particularly long. Some might even express an interest in the subject; let's say it's modern art. But they leave almost as quickly as they enter without paying much attention to the artwork that the designers painstakingly displayed.

◆ Other visitors spend hours at the site but never seem to notice particular sections. For example, a visitor might be thoroughly familiar with the content on radios but oblivious to the section on industrial hardware.

These observations could describe visitors to Web sites, none of which are more than 10 years old. Actually, these observations describe museum visitors. As a type of institution, the museum has existed for nearly three centuries, and these concerns are nothing new to museum exhibit designers. Since the first research in the late 1920s and early 1930s, museum professionals have observed visitor behavior and, in response, transformed exhibit design practices (Chambers 1999). These practices were further refined in the 1960s to 1980s as museums redefined their mission, from warehouses of artifacts to institutions of *informal learning* (that is, learning without a predetermined outcome) (Bloom and Powell 1984).

I systematically observed current exhibit design practices as part of an extended study. The primary purpose of that study was to see how practices from my primary field of study, instructional design (whose primary focus is on formal learning in the classroom, through workbooks, and online, with predetermined outcomes) transferred to the design of informal learning in museums.

An interpretation of these observations yielded a more flexible perspective on instructional design (Carliner 1998). It also yielded a number of communication practices that could be transferred from the community of museum exhibit designers to the community of information designers. Sharing that second set of interpretations is my purpose here.

Following a brief description of the research project, I share 8 lessons, or categories of practices, that I observed. For each lesson, I first describe in detail what I observed in museums. Immediately afterwards, I suggest how information designers might apply these lessons when working on technical communication products. I close with some broader thoughts about these lessons.

"WHAT SEPARATES A MUSEUM WORTH SUFFERING FOR FROM ONE YOU WOULDN'T STOOP TO BE SICK IN?"

So wondered Judith Stone, writing in a special 1993 issue of *Discover* that focused on the emotional and educational impact of science museums on scientists and science writers.

I asked myself the same question.

Museums have always fascinated me because they are some of the most complex and successful forms of scientific and technical communication. To answer the same question as Judith Stone, then transfer the lessons learned

back to the professional communities of instructional and information designers, I undertook a qualitative study of the design for three permanent exhibitions in history and technology museums, and related background and follow-up research.

The primary purpose of the study was to understand how members of the design team addressed instructional issues as they designed exhibits and to see which design practices for formal learning transferred to the design for informal learning in museum exhibits. The exhibits were purposely selected and included exhibits on

◆ The history of a major city in the U.S. at an urban history museum

◆ The history of the canning industry in the late 19th century at an industrial history museum in the U.S.

◆ Computer and telecommunications networks at a high technology museum in the U.S.

In the main study, each member of the "core" design team was interviewed three times. Core team members are those who play a primary role in designing and developing the exhibit. These team members include

◆ An *idea generator* who devises the concept for the exhibit, chooses the content, and writes the "storyline" (a detailed description of the exhibit and the preliminary draft of copy for the labels that appear in the exhibit)

◆ The *exhibit designer*, who prepares the physical design of the exhibit, including its floor plan and graphic identity; chooses wall and floor coverings; designs display cases; and prepares blue prints

◆ An *idea implementer* who acts as a general contractor of sorts for the exhibit, securing objects for the exhibit that are not in the museum collection, overseeing the work of the peripheral team (specialists who implement the plans), ensuring conservation of items to be displayed, and making sure that the design is implemented according to plans

For each exhibit, members of the peripheral team were also interviewed when feasible. These team members provide specialized skills needed to develop a part of the exhibition. Skills needed on the peripheral team vary among exhibits. Typically, this team includes a museum ducator (whose job is to develop programs geared toward school groups that are related to the exhibit content), public programs coordinator (whose job is to develop programs geared toward adults and the general public), registrar (whose job is to oversee the documentation and protection of objects in exhibits), media specialists (including video and interactive specialists), and editor (whose job is to edit the copy for all labels and gallery guides associated with an exhibition). In addition to the interviews, I observed team meetings and reviewed project plans when feasible.

The study followed the grounded-theory methodology.

The study followed the grounded-theory methodology. A central feature of this methodology is constant comparative analysis. That is, data is constantly analyzed throughout the data collection process to devise theories; collected data is later compared with the evolving theory to determine whether it supports the theory (Strauss and Corbin 1994, p. 273). Strauss and Corbin suggest a three-phase process for analyzing data. The first phase is *open coding*, which they define as "the process of breaking down, examining, comparing, conceptualizing, and categorizing data." The next phase is *axial coding*, "a set of procedures whereby data [is] put back together in new ways after open coding, by making connections between categories" (Strauss and Corbin 1990, p. 96). The last phase is *selective coding*, "the process of selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development" (1990, p. 116).

Whenever they are coding, researchers mainly look for dominant patterns—patterns that appear in all sites studied. Researchers also look for weak patterns: ones that occur in at least two sites. Researchers try to explain why a weak pattern might not be observed at the other sites.

Besides the core research for this study, I conducted preliminary and follow-up research. This research consisted of a literature review; observations of visitor behavior in a science center in a large city in the U.S.; visits to over 200 museums in the U.S., Canada, Europe, and Asia; and participation in two conferences and other events for museum exhibit designers.

1. "DID ANYONE TARGET AN AGE GROUP?"
What I observed in museums

Because visits to museums are voluntary in nature, museum staffs must motivate people to visit (Csikzentmihalyi and Hermanson 1995). First, museum staffs must motivate visitors to enter the building. To do that, they must work past an impression among the public that museums are primarily intended for people from upper economic classes and the majority religious and racial groups (Zolberg 1994). Such impressions have, in the past, made people from outside of those groups feel unwelcome in museums. This challenge is similar to that faced by businesses that want to sell products and services outside of their countries or to historically marginalized groups like women, African Americans, Latinos, and gays and lesbians.

To address this concern, museums have attempted to broaden their constituencies. This is a policy of the mu-

> # Other exhibits are designed to appeal to targeted constituencies, ones whom museums typically ignored in the past.

seum profession backed by practices in specific museums. Believing that diversity behind the scenes is essential to representing diversity elsewhere in museums (including exhibits), museums have established formal relationships with constituency groups. For example, the high technology museum in this study has an advisory board of low-income children, and the Brooklyn Museum has an outreach project with the surrounding neighborhood. Museums have also made a concerted effort to broaden the socio-economic, gender, and ethnic backgrounds of their staffs and boards, and continue to do so (Hirzy 1992).

These behind-the-scenes changes are reflected in exhibits that have a different type of appeal than in the past. In some instances, exhibits are designed to appeal to the general public. Called "blockbusters," they are temporary exhibits (running from a few months to a year), focusing on well-known topics with broad public interest; they are primarily intended to lure large numbers of visitors (Lee 1994). One of the first was the 1979 King Tut exhibit that visited major art museums, and it has been followed by blockbusters such as the Monet exhibit that visited the Art Institute of Chicago in 1995 and the Titanic exhibit that visited the Museum of Science and Industry in Chicago in 2000. Museums can see attendance surge by as much as 33 to 50 percent during a blockbuster.

ther exhibits are designed to appeal to targeted constituencies, ones whom museums typically ignored in the past. Some of these exhibits are temporary, like the retrospective of African-American artist Jacob Lawrence at the High Museum of Art in Atlanta and an exhibit on the contributions of women engineers at the Franklin Institute in Philadelphia.

Some exhibits for targeted audiences are permanent, like the First People's galleries in the Canadian Museum of Civilization in Ottawa. Following its most recent renovation, the Minneapolis Institute of Arts devoted half of its permanent gallery space to non-Western art. Previously, such art occupied less than a third of the gallery space.

Within these exhibits, staffs design interpretive materials like labels (signs within the exhibit that contain explanatory text) and media presentations. When developing these materials, staffs take into account the diversity of experiences that affect interpretation of an object because staff members want to avoid foisting their own interpreta-

tions on the public. Many interpretive materials now describe the outside factors that shape the meaning of objects and topics on display.

In addition to exhibits, museums also provide related public programs that are targeted to particular communities. Some programs focus on singles, such as the High Museum's Young Professionals, which is geared toward people under the age of 40. Other programs focus on underprivileged youth, such as an after-school program sponsored by the Computer Museum.

Although some exhibits and activities are intended to draw targeted audiences, exhibit designers know that the museum is a public place and the entire public must feel welcome in each exhibit. So ultimately, these designers lack a clearly defined audience. In fact, at a meeting of exhibit designers at the 2000 American Association of Museums Annual Meeting, one designer asked, "Did anyone target an age group?"

Still, efforts to broaden the appeal of museums have changed public attitudes toward them over time; they're places people increasingly choose to go. In the U.S., for example, more people visit museums in a given year than attend professional sports events (Ivey 2000).

Lessons for Web design
Like museum exhibit designers, designers of Web sites need to appeal to a variety of demographic groups. As businesses increasingly market globally, the literature on technical communication provides substantial guidance in addressing geographically distinct markets for whom information will be translated and localized (Hoft 1995).

The community of Web site designers and technical communicators pays less attention to other aspects of cultural difference. For example, little has been written about the impact of occupational culture and socioeconomic class on technical documents. More significantly, because many believe that technical communication is objective (that is, free from bias), technical communicators are rarely encouraged to identify their own cultural biases and explore how they might affect the communication products that they develop.

2. "KEEP THE COLLECTION FROM KLUMMETTING YOUR GUESTS."
What I observed in museums
The industrial history museum that I studied does not have enough exhibit space to physically display the tens of thousands of hand tools in its collection, much less the other artifacts, like machinery and manufactured goods. At the time of the study, the museum did not have enough storage space on the premises to store objects it could not display. The staff stored them in a rented storage space several miles from the museum. The idea implementer

explained that museums typically display only 10 percent of their collections at a given time.

Objects form the centerpiece of most museum exhibits. Because of that, and because the primary purpose of museums is educational, museum professionals often refer to their work as *object-based learning*. One of the most significant choices a museum exhibit design team makes, therefore, is what to display. Choices are purposeful. As exhibit designers learned when they would cram entire collections into a series of glass cases, which visitors would ignore, "You have to keep the collection from klummeting [overwhelming] your guests." But in choosing which objects are displayed, exhibit design teams also choose which objects remain in storage.

This choice is made in the early stages of design. Because museum exhibits effectively involve a major renovation of a building and therefore require budgets that exceed the costs of most homes, they are funded in two phases. The first is the less expensive planning phase, which is similar to the needs analysis and requirements phase of a technical communication project. If funders have concerns about the plans, those concerns can be resolved before spending large sums of money needed to actually build the exhibit.

In the planning phase, the idea generator works with a team of content experts and educational specialists to devise a focus for a proposed exhibit. Then the idea generator and idea implementer work together to develop the detailed plans for the exhibit, called the storyline. The storyline is:

> *a written document that presents the key elements of the visitor experience. The storyline refines the subject of the exhibition, identifies key topics to be addressed in the exhibition, and discusses possibilities for presentation, including how content in the exhibition might flow and be presented, and the types of objects to be included. Members of the staff who are going to work on the exhibit design team are identified at this time, although only the idea generator and [idea implementer] take the most active roles during this phase. The staff often reviews the museum collection at this point to determine what objects it already has and the objects it might need to collect to effectively realize the exhibition. (Carliner 1998, p. 84)*

In other words, only after the content is chosen do exhibit design teams choose objects. In some cases, several objects might meet the needs of the content, so design teams choose objects based on their anticipated appeal to visitors and condition. In some cases, because funds for conserving objects are more plentiful when associated with an exhibit, the design team might choose an object that needs conser-

vation. In other cases, the design team might purposely choose a *touch object*—that is, one that visitors will be encouraged to handle. Touch objects must be physically durable.

Some museums have addressed the problem of large collections on an institutional level. Those museums that have comprehensive collections in each topic area addressed by their missions need buildings of immense physical size merely to display and house these collections. Within a given topic area, some collections are sufficiently large that they could comprise museums themselves.

Museums have tried many approaches to shield visitors from this enormity. Some have spawned other museums. For example, the Washington, DC-based Smithsonian Institution has several museums, each focusing on a particular subject area. The London-based Tate Gallery opened a satellite museum to display its modern art collection. The New York-based Guggenheim Museum opened one of its satellites on another continent, in Bilbao, Spain.

Although museums usually have more objects than they can display, many still find themselves short of objects when planning new exhibits. For example, each of the museums that I studied lacked objects in their collections needed for the exhibits studied. In two of the exhibits, new acquisitions represented over 50 percent of the objects ultimately displayed. In each exhibit, too, designers used *fabricated objects* (that is, built for the exhibit rather than true historical artifacts). Some objects were fabricated because the designers wanted visitors to be able to touch them, and real objects would fall apart under such wear. Other objects were fabricated because real ones did not exist.

On the other hand, entire museums have opened with signature buildings and without extensive collections to support them. Building collections is proving difficult for these museums. For example, the core collections for many natural history museums opened at the beginning of the 20th century are specimens of large animals collected on hunts in wilderness areas. Killing endangered species of animals for display in museums is no longer an acceptable practice. Similarly, as prices for art skyrocketed in the 1980s and 1990s, many art museums that have seemingly large

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acquisitions budgets still do not have enough money to purchase pieces for their collections.

Lessons for Web design

As museums have learned to focus exhibits and limit the amount of information to which they expose visitors, so designers of Web sites must learn to focus their content and limit the amount of information to which they expose users.

With easily available computer storage and increasingly sophisticated search mechanisms, communicators have little technical incentive to limit information. Furthermore, with the promise of ready access to all the knowledge in the world through the World Wide Web, some communicators understandably feel an ethical commitment to provide full access to information that the user has a need to know. That technical communicators have always been committed to completeness only strengthens this commitment.

But our values and technology conflict with users' needs and experiences. Consider the following:

◆ According to studies by User Interface Engineering, using a search mechanism leads users to information of interest less frequently than links (1997). That fact places an ongoing premium on the ability to carefully structure and chunk information for users.

◆ The growth of profiling software and intelligent agents provides communicators with both the incentive and tools to tailor each online experience as much as possible to the unique needs of a user. The effectiveness of the rules that operate this software directly emerges from communicators' ability to identify users' bottom line goals and scenarios of use, as well as to develop lists of relevant characteristics that affect a profile.

Technology, alone, then does not solve the problem of "klummeting users" with information; only design practice does. For example, one tool in controlling information is *behavioral objectives* (also called *learning objectives*). Objectives state what users should be able to do after completing a tutorial. Instructional designers develop objectives before starting work on a tutorial and use them to focus their work. They include only content that directly supports the objectives. Other content is discarded or, if it must be incorporated, changes the scope for the project (Mager 1997).

3. "AN EXHIBIT IS NOT A BOOK ON A WALL."

What I observed in museums

When the design was driven by subject-matter experts called *curators*, the heart of most exhibits was a series of cases crammed with artifacts (such as paintings, furniture, textiles, photographs, and documents) and accompanied by detailed documentation on each object (usually typewritten). This dense documentation was primarily prepared by one scholar for use by other scholars.

This reference-like approach to displaying objects created a barrier between museums and the public. The public was overwhelmed by the quantity of objects and the technical language and detail of the documentation. In fact, studies indicated that few visitors actually read labels, and, of those who did, most spent less than half a minute doing so. When museums started broadening their audiences two decades ago, they realized that

> [the] museums of the past [would have to] be set aside, reconstructed, and transformed from a cemetery of bric-a-brac into a nursery of living thoughts. (La Follette 1983, p. 41)

In response, exhibit designers transformed their approach to design, using four concepts to guide them in their efforts.

Guiding Design Concept A: Immersion   The first guiding concept is *immersion*. According to the idea generator at the urban history museum I studied, a museum exhibition should immerse visitors in its story. She noted that a nearby zoo uses this immersion theory of exhibit design. The zoo's designers "put people where the animals are and let [visitors] become a part of the experiment." She applies these beliefs and theories to all the exhibits at her museum. "It's theater," she noted, "yet the objects are real, just as animals are real [in the zoo]." In her exhibit, visitors are immersed in the city at four periods in time: an open field from the time preceding settlement, a city street from the late 19th century, another city street from the early 20th century, and a highway scene from the late 20th century. The designers of the two other exhibits studied also used immersion.

Guiding Design Concept B: Themes   The second guiding concept is dividing complex topics into a limited number of key themes. A designer participating in the exhibit brainstorming session at the 2000 American Association of Museums Annual Meeting called this "modularity." Because topics for exhibitions are often broad and the number of facts presented is more than a visitor can process in the short time of a typical visit, designers try to identify a limited number of broad points on which to focus, and build exhibits around them. Each of the exhibits that I studied had fewer than five themes. By limiting the number of themes, designers hope to increase the likelihood that visitors will better recall the insights from exhibits.

For example, designers focused on four key themes in

the development of the city featured in the exhibit studied at the urban history museum rather present a timeline of development. These four themes corresponded to four distinct phases of the city's development, and the design team built four galleries, each immersing visitors in a phase of the city's development.

Guiding Concept C: Layering The third guiding concept is that of layering content. The idea generator at the urban history museum explained it best. She insisted that an exhibit is not "a book on a wall." In other words, visitors should not have to read all the labels to learn about the topic of the exhibit. Instead, they should be able to explore in as much detail as they like and leave feeling as if they learned a complete topic.

She designed her exhibit so that labels—text signs on the wall that provide explanatory information—are presented in three levels of depth. Visitors can look at the label and identify its tier, and read all the labels in a chosen tier see a complete story. These tiers included:

1. Introduction to the gallery. These labels provide the title of the gallery and an orienting quote. The orienting quotes originated during the time period depicted in the gallery. These labels are the largest, so visitors can easily identify them several feet away.

2. Theme labels. These labels introduce key themes in the exhibit. The labels consist of a heading, a limited amount of text (no more than 12 lines) and, occasionally, a drawing or reproduced photograph. The text on these labels is large enough to be seen a few feet away.

3. Object labels. These labels, the most numerous in the exhibition, describe characteristics of individual objects, such as their significance or the materials used to make them. Not every object has a label. The text on these labels is the longest, but rarely longer than 12 lines. The type on the labels is small; visitors must stand close to read it. Some of the object labels also have pictures to further amplify points.

Guiding Concept D: Skimmability The fourth guiding concept is skimmability. Because visitors come from all ages and educational and professional backgrounds, designers cannot assume they know the technical language associated with the subject matter of the exhibit. In addition, because visitors are usually standing on their feet when they read the labels, reading labels can quickly become an uncomfortable experience. Finally, most visitors usually have a limited amount of time, either because they have other activities scheduled, want to leave time to see other parts of the museum, or are visiting with an impatient friend or relative. Therefore, designers must write the labels to be skimmed while standing, rather than studied while sitting.

Lessons for Web design

Just as the designers of early television quickly realized that a television show was not a radio show with pictures, so designers of Web sites are learning that readers do not prefer to read long passages of text on a computer screen, electronically distributed books not withstanding (Marsh 1997). In fact, some studies show that users do not read online; they skim. Users don't skim everything, merely the first few lines on a screen. In those instances where they do read word-for-word, users typically read more slowly online than they do in a book (Horton 1995).

As objects distinguish museum exhibits from books, and pictures distinguish television from radio, so the ability to interact and the ability to integrate several media distinguish computers from books and other types of media. Many of the design techniques used to control the flow of data in a museum exhibit may also work online:

◆ As exhibit designers use immersion to recreate environments for visitors, so Web site designers can use simulation to recreate environments for users.

◆ As exhibit designers layer content so visitors can choose a desired level of complexity, so interface designers can create layered interfaces to match users' experience levels and layered help systems to match users' appetite for information (Wilson 1994).

◆ As exhibit designers design skimmable exhibits, so Web site designers present content in a scannable mode, using such devices as navigational tools, headings, lists, charts, and graphics to promote scanning (Carliner 2000).

4. "EVEN THE BEST SIGNAGE CAN'T FIX A POORLY DESIGNED MUSEUM."

What I observed in museums

The designer of the exhibit on computer and telecommunications networks at the high technology museum I studied commented that visitors should have the "realization that what [they]'re experiencing is unique, powerful, and challenging." A good exhibition "keeps [visitors] coming around the corner" and "makes [them] want to explore."

Because the physical location of objects within an exhibit has a significant impact on visitors' experiences, exhibit designers try to consciously use space.

Conscious use starts with the general layout of the exhibit. Some designers like to create a hub of activity, such as the designer of the exhibit on networks:

I wanted a big circle in the center, as if the exhibit radiated from a hub. I like to start with a larger metaphor. . . . Even if people don't realize it, the exhibit has strength of that organization. It makes everything flow naturally, according to a plan. Otherwise, it's just a space layout. . . . Whether people understand or not,

they know something's there for a reason. . . . [Visitors] should always see the hub. That's how it is on the network.

The concept evolved from my work in retail. The [bookstores I designed] have a book layout, with "pages" on either side [of a central aisle]. Nobody thinks about it but it's an organization method that, at the least, makes sense.

Others prefer a layout that lets visitors enter from any point. That's what the idea generator at the urban history museum I studied prefers. Rather than following a timeline, she wanted to make it possible for visitors to enter the exhibit at any point in time and coherently follow the story forward or backward from that point.

Sometimes a controlled approach is necessary. Because sequence is integral to telling the story of the canning factory, designers planned for it to be followed in a specific sequence, with definite starting, middle, and ending points. Some museums use the sequential approach as a means of controlling crowds. For example, the temporary galleries in the Boston Museum of Fine Arts and Minneapolis Institute of Arts are intended to be followed in sequence because it is the only way to manage the large crowds in blockbuster exhibits and because these exhibits are separately ticketed, requiring a single entrance.

Floors and walls also become design elements. For example, the designers at the urban history museum in my study used flooring that would simulate a sidewalk in one gallery and a highway in another. The designer of the exhibit on networks that I studied chose a mesh wall covering to enhance the high tech mood and image of the exhibit.

Raising or lowering the level of light in a gallery also helps create the mood of an exhibit. For example, lighting in the galleries of street scenes in the urban history museum I studied have a high lighting level to simulate daylight. Sometimes lighting levels are dictated by practical considerations. Because fragile textiles, books, sketches, and paintings fade in bright light, exhibit design teams must often lower light levels to preserve the objects.

Idea generators and idea implementers also become involved in the design of floor space. They choose *signature*

> ## In addition to considering the floor space of the exhibit, designers also consider traffic patterns in the museum building.

objects to catch visitors' attention and beckon them forward in an exhibit. Placed in one section of an exhibit, signature objects are large objects that can be seen from another part of the exhibit. For example, a fire engine in the urban history museum in my study and an Egyptian temple (complete, and inside the gallery) in the Metropolitan Museum of Art are examples of signature objects. Similarly, museum educators become involved in the design of floor space. The educator at the urban history museum noted that she always has to remind the design team to leave a "gathering space" in exhibits so she has a place where she can speak to a group of 20 to 40 students at a time.

Laws in some jurisdictions require that exhibits be accessible to all visitors, regardless of their physical disabilities. For example, to accommodate visitors in wheel chairs, exhibit designers typically add ramps to exhibits that have sunken or raised areas, ensure that visitors in wheelchairs have sufficient clearance between objects, and make sure that they can read labels from their sitting positions. Although not required by law, many exhibit designers also include seating areas in exhibits because older adults and young children need a place to rest in the middle of an exhibit. The design team at the urban history museum I studied also tested its exhibit with people in wheelchairs to make sure that the accommodations met the needs of these visitors.

Fixed architectural elements also affect the design of the floor space. For example, one of the obstacles facing the design team at the high technology museum in my study was a stairwell in the middle of the exhibit (the stairs were not part of the exhibit). It could not be moved, so designers had to figure a way of incorporating it into the exhibit.

In addition to considering the floor space of the exhibit, designers also consider traffic patterns in the museum building. Some staffs place popular temporary exhibits at the end of a hallway, subtly requiring that visitors walk by permanent exhibits they might otherwise miss. Architect Richard Meier designed the High Museum of Art in Atlanta so that visitors could see nearly all the exhibits from the atrium at the entrance. Based on this initial scan, visitors can decide where to begin exploring.

Despite research into the traffic patterns of visitors in museums, not all museum buildings are easily traversed. Some museums try to compensate for a non-intuitive floor plan with extra signage. But as one exhibit designer noted in the brainstorming session of museum exhibit designers, "even the best signage can't fix a poorly designed museum." Another commented that wayfinding within a museum has "little to with signs and maps. [It] has to do with the layout of the building."

Lessons for Web design

As museum exhibit designers have learned that physical space is a key communication resource, so Web site de-

signers have learned that screen real estate is a key communication resource. Consider:

◆ Because of the consistency of the Windows and Macintosh interfaces, users expect to find certain types of information at certain locations on the screen, like the menus and button bars.

◆ Similarly, because of the patterns of eye movement, users are more likely to see information placed in certain areas of the screen than in others (Horton 1995).

◆ Because many users typically do not scroll down, communicators have learned that they need to include mechanisms for encouraging users to scroll down and move forward to related pages (User Interface Engineering 1998).

◆ As exhibit designers have learned that the physical layout of a building constrains their ability to help visitors effectively find their way through the museum, so interface designers have learned that the structure of the underlying code constrains their ability to effectively design an interface. For example, a poorly structured program often results in a confusing menu. One software developer commented, "I can usually look at an interface and tell you the underlying structure of the data."

Based on these observations and experiences, Web designers might do the following:

◆ Consciously place information on the screen, making sure that key information appears in places where users are most likely to see it. Commercial sites have already learned to place advertisements at the top of a page and along the right margin to increase attention to them. We haven't developed similar conventions for technical information. Perhaps we could follow the example of cnn.com on its long stories, and place a table of contents at the beginning of the page. Or perhaps we can place summaries of key points along the right margin.

◆ Create "signature objects." The most likely signature object for a Web site is exclusive content. The challenge is most acute on commercial Web sites (whether business-to-consumer or business-to-business), because so many Web sites license content from third parties who, in turn, license the same content to other parties. Consider news. Many sources suggest that that a news feed brings visitors back to a site. But if the news feed to one site comes from the same source feeding a competitive Web site, that news is not a signature object. As museums have learned, a copy of the "Mona Lisa" does not have the same signature value as the original.

◆ Design for accessibility by people with disabilities. The technical term for this type of design is *univer-*

> The recipe for successful storytelling in exhibits is the same as that in literature: riveting plots and engaging characters.

sal design because it is a strategy to provide access to all. Many designers assume that adaptive equipment and specialized software can handle many of the challenges faced by persons with disabilities. For example, large screens and specialized software can increase the size of a display for people with visual impairments. But such hardware and software do not solve the problem of an inconsiderate design. For example, consider the problems encountered by a user of a Web site that relies heavily on audio cues, and does not provide alternate presentations of that data, such as transcriptions.

◆ Consider traffic patterns. On the one hand, designers want to make sure that visitors notice the most important or sought-after information on the Web site. However, as museum designers place less-known exhibits in the path of the sought-after ones to give those less-known parts more exposure, so Web site designers might place less-known content ahead of the better known material as a means of introducing visitors to other parts.

5. "MUSEUM EXHIBITS MUST CAPTURE THE VISITOR'S CURIOSITY."

What I observed in museums

The idea generators at each museum studied all agreed: at the heart of a good museum exhibit is a good story. Like stories in books or film,

> *museum exhibits must capture the visitor's curiosity. . . . Our attention is attracted by novel or unexplained stimuli—a loud noise, a sudden bustling activity, a strange animal, or a mysterious object. It is by appealing to this universal propensity that museums can attract the psychic energy of a visitor long enough so that a more extensive interaction, perhaps leaning to learning, can later take place. (Csikzentmihalyi and Hermanson 1995, pp. 36–37)*

The recipe for successful storytelling in exhibits is the same as that in literature: riveting plots and engaging characters.

To create riveting plots, museum exhibit designers employ a number of standard storytelling techniques. One of the most basic is making sure the exhibit has a distinct

beginning, middle, and ending. For example, the exhibit on networks that I studied begins with a two-part opening: a video overview, followed by a room where visitors received an "identity card." Visitors use the card to choose one of four virtual tour guides to lead them through the exhibit (seen by visitors on interactive display terminals); the computer records the choice on the identity card, and so visitors see related material at each guide station in the exhibit. The middle of the exhibit is a sequence of galleries, each of which describes a different type of network. The exhibit ends with another two-part sequence: a gallery presenting the negative side of networks, followed by a room where users can connect to the Internet.

Within the exhibit, exhibit designers use common storytelling techniques such as *immersion*, juxtaposition, repetition, and subliminal messages to engage the visitor. In addition to serving as a guiding principle of content development described earlier, immersion also serves as a storytelling technique, much like establishing shots in film and description in novels. It physically places visitors in the environment of the objects.

For example, the Scandinavian Heritage Museum in Seattle tells the story of immigration from Scandinavia to the U.S. by literally guiding visitors through a sequence of scenes depicting the journey. Visitors see such scenes as rural poverty in the Old Country, a crowded ship carrying immigrants, and homes in the New Country. The Minneapolis Institute of Arts recreates period rooms from Charleston, Paris, and London to depict furniture styles of the past. Exhibit designers believe that experiencing a subject through immersion is so essential to the success of an exhibit that they include it in grant proposals to persuade funders to support the exhibit.

Even a seemingly minor detail contributes to the authenticity of the immersion environment. For example, the walls in each gallery of "Without boundaries" were painted specific colors to enhance the authenticity. Green walls in the first gallery provide a pastoral feeling, typical of a newly settled rural area, while gray walls in the gallery depicting the commercial growth of the city evoke a business-like mood. Sometimes the building itself creates authenticity. The industrial history museum that I studied is housed in a former canning factory. In addition to adding authenticity, this history actually inspired the subject of the exhibition.

Another storytelling technique is *juxtaposition*, in which two opposing images or concepts are positioned near one another so visitors can make the contrast. The designers of the exhibit on the history of the city in my study juxtaposed the clothing of early European settlers with that of Native Americans, so viewers would sense the culture clash that would define the early history of the region. Later in the exhibit, the designers recreated a street with scenes from white culture on one side and scenes from African-American culture on the other, to show their separate histories in the community. An activity that takes place within the exhibit on the canning factory juxtaposes managers and workers in the same work environment.

With *repetition*, an image or concept appears more than once in an exhibit to reinforce a point. Exhibit design teams purposely repeat points to increase the likelihood that visitors will remember them. For example, clothing typical of an era was included in each gallery of the exhibit on the history of the city to emphasize its importance as a cultural statement in each period of the city's development.

Exhibit designers also include *subliminal messages*, messages they hope make an unconscious impact on visitors. Three stones in the first gallery of the exhibit on the history of the city in the urban history museum each represented a different phase in the early growth of the city. Designers did not expect most visitors to recognize the significance of these stones. In fact, designers at each museum I studied did not expect visitors to understand their subliminal messages, but the idea generator at the urban history museum said that some visitors tell her that they do get these messages.

In addition to a tightly crafted plot, a good story must be populated by engaging characters. Exhibit designers address this issue, too, in their exhibits. Each of the three exhibitions I studied included key characters. In two of the museums studied, the characters were fictional but emerged from extensive research and were composites of real people. For example, the virtual guides through the exhibit on networks were intended to represent different segments of the local population. One was a homeless person. Research with the homeless population helped exhibit designers flesh out this character. Similarly, the designers of the exhibit on the canning factory included descriptions of workers and managers. Although the names were fictional, their life stories were based on information in the museum archives.

As stories are about people, so they must appeal to people. Therefore, the gauge for assessing planned storytelling techniques is their anticipated appeal to visitors.

"The link between the museum and the visitor's life needs to be made clear . . . the objects one finds and the experiences one enjoys, while possibly inspiring awe and a sense of discovery, should not feel disconnected from the visitor's experience" (Csikzentmihalyi and Hermanson 1995, p. 37).

At the most basic, museum exhibit design teams try to appeal to everyday and today. For example, a living room in the exhibit on networks showed how networks affect modern home life. The last activity in the exhibit on the canning factory gives visitors an opportunity to relate work of the late 19th century to work today.

Although exhibit designers make liberal use of story-telling techniques, they sometimes have difficulty finding the human story in the otherwise academic topic of a proposed exhibit. "What's your story? [Sometimes, it's] really hard to get it out to visitors," commented an exhibit designer attending a meeting of her colleagues at the 2000 American Association of Museums Annual Meeting.

In contrast, another designer commented that she is "more interested in the voices and stories than the technical aspects of the exhibit." She admitted that the technical aspects are essential in the practical challenge of bringing the story to the public.

Lessons for Web design

As exhibit designers rely on storytelling techniques to engage visitors in the content of exhibits, so some Web site designers are relying on storytelling techniques both to engage visitors and to use as a planning tool.

Here are some of the ways that Web site designers use storytelling techniques as a planning tool.

◆ Describe the background story. One common writing technique in storytelling is sketching out a character's *backstory*: the experiences that preceded those told in the piece being written. Web site designers use a similar technique called scenarios or *use cases* (Nurminen and Karppinen 2000). A scenario describes the real world situation (or backstory) that drove a user to consult a particular Web site.

◆ Describing users as real people rather than demographics. Author Alan Cooper (1999) recommends that Web site designers also prepare descriptions of *archetypes*—that is, provide character descriptions of typical users. As the many characters of a good story often represent a diversity of experience or perspectives, so do archetypes. Cooper recommends that, at the least, the archetypes represent a user who will easily adapt to the changes, one who will have difficulty, and one who represents the middle-of-the-road user. By defining this spectrum, communicators are more likely to address all in a Web site rather than a single type of user who is represented by the demographics of the intended users.

In addition, designers can also employ many of the same storytelling techniques used in museum exhibits in Web sites. For example, as exhibit designers "immerse" visitors in a setting, so Web site designers simulate experiences. The technique is widely touted in games and online learning. For example, the game SimCity (admittedly, not yet on the Web) immerses visitors in the development of a city. A Web-based simulation developed for internal use by marketing representatives at Dell Computer mimics a virtual pet, but instead of participants following

> ## In addition to a tightly crafted plot, a good story must be populated by engaging characters.

the life of an animal, they follow the day of a marketing representative (Hartley 2000).

Similarly, as exhibit designers try to create a mood for their exhibits, so can Web designers. For example, a graduate student who was visiting a cybercafé in Manhattan (New York City) commented on the way that the designer of the home pages used in this café re-created the Gotham mood online:

> *I sat in the cool air [as] I waited for the default homepage to load, I noticed that a designer did a wicked cool thing with the interface. As the gray letters emerged from the black background, the designer played a movie in the background. Cars, people, and trucks passed by. The sound was cool, too, and when a horn sounded I jumped! The sound didn't come from the speakers! I watched the reflection of real life—a busy Manhattan street—in my screen!*

As it works as a storytelling technique in exhibits, so juxtaposition is an effective storytelling technique online. On some Web sites, designers visually juxtapose contrasting content. For example, on vote.com, designers present a series of issues. Beneath a value statement, designers place the description of the "pro" position on the left and the "con" position on the right. Similarly, following a news story, CNN lists Web sites with related content, letting visitors surf to sites representing opposite points of view.

Subliminal and subtle messages are also an important part of Web sites. They tend to show up more in design efforts helmed by graphic designers and artists than by those led by usability experts, who tend to take a more utilitarian approach to design (Every 1999).

6. WORK TOWARDS "WOW!"

What I observed in museums

"The first thing we're looking for is for people to say, 'Wow!'" commented the director of the then-new Futures Center at the Franklin Institute in Philadelphia (Behr 1989). He's not alone. When reviewing the designs for a proposed exhibit at the high technology museum I studied, the museum educator asked her colleagues, "Where's the fun factor?" Almost universally, the designers of museum exhibits hope their visitors have a pleasant experience.

Part of this interest stems from a genuine desire of the design team to share their passion for a subject with visitors. For example, the idea generator for the industrial history museum wants to help visitors understand their ancestors' experience at work. "[They] spent more than a third of their lives at work; the museum fills a large void in people's understanding of the past." The director of public programs at the urban history museum wants her visitors to "enjoy the experience" and leave exhibits "knowing, thinking, and feeling."

In some cases, the need to "wow" visitors emerges from more practical considerations. According to one exhibit designer, museums must compete for visitors with other "cool stuff," including other museums, movies, theme parks, performing arts, and sporting events (Mintz 1994; Zolberg 1994). Some of these competitors are becoming more like museums. For example, theme parks such as EPCOT in Orlando, FL, and the Luxor Casino in Las Vegas, NV, are displaying and interpreting objects, as museums do, but with larger budgets and more lavish presentations. This competition raises visitor expectations of effective exhibits (Mintz 1994, p. 33). In other instances, museums compete with other types of entertainment, such as movies, theatrical and musical performances, and sports.

Exhibit designers choose topics with strong popular interest not only to broaden their audiences, but also to attract visitors. For example, because many young children have a fascination with dinosaurs, most science and natural history museums regularly schedule dinosaur-theme exhibits. When possible, they have dinosaur skeletons and eggs in their permanent collections, as do the American Museum of Natural History and the Los Angeles County Museum of Natural History. Well-known artists (especially Impressionists) are similarly popular attractions for art museums.

Well-known objects can also attract visitors. People visit the Art Institute of Chicago to see the painting "American Gothic," the British Library in London to see the original draft of the Magna Carta, the Israel Museum to see the Dead Sea Scrolls, and the Smithsonian's National Museum of History and Technology to see the collection of gowns worn by American First Ladies to the balls celebrating the inaugurations of their husbands as U.S. presidents. The idea generator at the urban history museum noted that objects are powerful teachers because

> *[they] hold their own experiences. People ask "Is this real?" If it weren't, it wouldn't be here.*

An object in a temporary exhibit can have a similar drawing power. A pre-opening furor sparked by comments made by the mayor of New York City over a painting of the Virgin Mary composed, in part, of elephant dung lured visitors to "SENSATION: Young British Artists from the

Subliminal and subtle messages are also an important part of Web sites.

Saatchi Collection," an exhibit at the Brooklyn Museum.

The need to wow visitors continues after they arrive in the exhibit; designers must maintain visitors' interest. The signature objects mentioned earlier serve such a purpose. Sensory experiences, like the simulated earthquake at the California ScienCenter in Los Angeles, are intended to engage senses other than the sight. Although admittedly more sedate, some museums create a multi-sensory experience through music or continuous playing of recorded environmental sounds in the exhibit area. For example, the urban history museum I studied plays recordings of ambient sounds in the exhibit.

Some exhibit designers try to create an emotional reaction among visitors. For example, the urban history museum displayed a robe from a Ku Klux Klan member. A dark gallery with metallic accents in the exhibit on computer networks at the high technology museum was intended to create a "big brother is watching you" feeling.

Exhibit designers try to transport visitors to other times and places. The exhibit on the canning factory in the industrial history museum recreates the world of work in the late 19th century. The National Maritime Museum in Greenwich, UK, recreates scenes from the journeys of British explorers in the 16th and 17th centuries. In its "Traveling the Pacific" exhibit, the Field Museum of Natural History recreates a market in the Philippines.

But the exhibits that seem to create the strongest feeling of "wow" among visitors are interactive ones. The Exploratorium, a science center in San Francisco, pioneered the interactive exhibit. At that museum, visitors perform mini-experiments to discover scientific principles; then, if they want, they read the explanatory material to learn more about the principles (Hein 1990).

Another interactive technique is the use of touch objects that was mentioned earlier. Museum exhibit designers believe that one of the most powerful learning experiences in museums occurs when a visitor can touch real objects, so they try to provide this experience whenever possible. In some instances, however, it is not. Contact with oil from human hands, for example, can damage fragile artwork. Climatic conditions can destroy documents. Light fades fabrics. Visitors sometimes damage objects, though not always intentionally. A visitor to the Minneapolis Institute of Arts thought a chair in one of the galleries was intended for weary visitors. When it broke after he sat on it, he learned that the chair was actually a delicate Chinese antique. But in cases where the potential for damage is slight, or the museum has a duplicate of the object, designers like

to place it on display as a touch object.

The public programs and education staffs can enhance the sense of "wow" in an exhibit. Public programs are those aimed at the general public. Sometimes the programs involve craftspeople demonstrating a type of craft on display. For example, the Fruitlands Museum in Harvard, MA, scheduled demonstrations by carpenters and blacksmiths to complement its exhibit of tools. Science museums often schedule demonstrations. For example, SciTrek, the Science and Technology Museum of Atlanta, schedules several demonstrations each day.

The education staff focuses almost exclusively on school groups visiting the museum. According to the museum educator at the urban history museum I studied, her colleagues at other museums typically develop scavenger hunts and activity baskets as tools to help young visitors notice all parts of an exhibit or focus on parts of special interests to their teachers (if the students attend with a school group). The idea implementer at the industrial history museum in my study added that she also develops materials that classroom teachers can use to prepare students for an upcoming visit and debrief the visit afterwards.

Lessons for Web design

As exhibit designers try to "wow" visitors with provocative subjects, interactivity, and similar techniques, so must Web site designers. One particular area of interest to Web site designers is the design of the interaction between users and the computer. Web site designers try to "wow" users in a number of ways.

- ◆ "Splash" screens, which display a brief animated sequence, are intended to capture and hold user interest. Web sites for commercial films, for example, usually start with an elaborate splash screen intended to generate excitement about the film. But the scene must splash quickly, or visitors will surf elsewhere.
- ◆ Profiling—the act of capturing information about a given user and using that information to tailor the Web site to that user's interests—attempts to "wow" visitors through personalization.
- ◆ Online communities and scheduled chats can foster a sense of loyalty among users and increase the number of visits to the site, just as public programs and education are also intended to help visitors discover parts of museum exhibits.

Two challenges face designers in bringing "wow" to their Web sites. The first pertains to technology. With each technical development often comes a new means of "wowing" users. But the challenge to Web site designers is finding techniques that engage users within the context of the Web site content, rather than as merely demonstrating the technology.

Furthermore, the same technologies that let Web sites develop and enhance profiles of users also involve an invasion of user privacy. Web site designers must determine at what point the value of better knowing users exceeds the risk of offending users by collecting and using information that users might not want anyone to be collecting. European law severely limits such practices. In contrast, American Internet users have shown a surprisingly high tolerance to tracking.

The second challenge facing designers in bringing "wow" to their Web sites comes from the almost religious battle between usability experts and graphic designers on ideal approaches to Web design. Usability experts, led by the likes of Jakob Nielsen, tend to focus on observable, measurable patterns of effectiveness that can be independently verified through usability research. But measuring affective responses like "wow" will tax even the best-refined research methodologies, and graphic designers and others with backgrounds in the arts and humanities are often hard pressed to produce data from universal research that would support the use of nonstandard approaches, like those of storytelling (Cloninger 2000).

7. AVOID "SOUND BLEED" AND OTHER MEDIA NIGHTMARES.
What I observed in museums

Two thirds of the way up the back wall of the entrance lobby to the Walker Art Center in Minneapolis is a horizontal line of lights that lead around a curve and beckon visitors through a hidden doorway. Beyond the doorway is a long, low, dark theater with built-in benches. On the three oversized screens at the front of this theater, a slide and sound show continuously plays. It introduces visitors to the primary temporary exhibit. When visitors leave the theater, they walk up a half a flight of stairs and enter that exhibit.

Visitors need no beckoning lights to see the "[city] in your face" video in the city history exhibit at the urban history museum I studied. It simultaneously plays on 12 monitors of various sizes hanging from the ceiling at the entrance to the exhibit. A glass wall behind the monitors gives visitors a glimpse into each of the four galleries; visitors can enter any gallery they choose.

At the end of a visit to the exhibit on the canning factory in my study, visitors participate in a computer-

> One particular area of interest to Web site designers is the design of the interaction between users and the computer.

In some instances, media presentations are as central to an exhibit as the objects.

based survey that asks them about the types of jobs they saw in the exhibit and helps them relate them to jobs in today's economy that might interest them.

As exhibit design teams at the Walker Art Center, urban history museum, and industrial history museum have done, so exhibit design teams at many museums are integrating media into their exhibits. In some instances, media presentations are as central to an exhibit as the objects. For example, in addition to the "in your face" video, the exhibit at the urban history museum includes three video theaters. The theaters are placed between pairs of galleries and are used to explain the transition from the time covered by the first to the time covered by the second. The videos playing there were created from photos and film footage in the museum archives. The idea generator explained that these videos provided an efficient means of telling the stories of these transitions; stories that the museum had neither the objects nor the gallery space to tell.

Other museums use computers in the exhibit area to provide visitors with access to additional information. For example, the Minnesota Historical Society has included some of the oral histories in its collection on a computer in its exhibit "Minnesota A to Z" so visitors have access to life stories of local citizens while learning about Minnesota culture. On interactive stations placed in education rooms near the galleries, the Seattle Art Museum provides an additional level of documentation about objects from its permanent collection and links users to background and related material.

The Internet is also becoming increasingly important to exhibits. Some Web sites serve as online brochures for exhibits, as at the Wing Keye Museum in Seattle. Some Web sites extend the visit by providing information that visitors might explore in advance and other information they might explore afterwards, such as the information accompanying the Field Museum of Natural History's permanent collection. Some Web sites serve as exhibits in their own right, either displaying digital versions of materials that are no longer on exhibit or separate displays that are available only online, such as the Museum of Modern Art's "Art safari."

Although videos and computer displays can extend an exhibit, each of the exhibit design teams I studied expressed frustration in working with media. New technology, inexperience, and significant under-budgeting affected the development of the virtual tour guides for the

exhibit on networks at the high technology museum. Programming bugs plagued some of the computer displays in the exhibit on the canning factory. What frustrated exhibit designers most, however, was that the program was written with proprietary software and was not documented. So when the company that wrote the program went bankrupt and the programmers literally left the country, the $10,000 station (about 5 percent of the exhibit budget) was unusable. Information on another computer was still usable, but the content was out of date and the staff did not have funds to revise the content.

Other than at the high technology museum, video production went smoothly for the museums studied. But exhibit designers wondered whether visitors actually watched the videos. My observation of visitors to a science center suggests not. The center had several video stations within its exhibit space. Each played video on demand; that is, a video would play after a visitor pressed a start button. Few visitors stopped at the videos.

Perhaps they were concerned about the noise from the video calling attention to themselves in the otherwise quiet space. Such sound bleed (that is, sound that can be heard outside its display area) is a practical issue in using video and other audio tools. Because many visitors like to read labels or think as they ponder an exhibit, museums are typically quiet places. Loud sounds from a video within the exhibit could break their concentration. Worse, should sounds in one gallery "bleed" (that is, be heard) in the next, the sound seems illogical and out of place, and reflects poorly on the designers.

Lessons for Web design

As in museum exhibits, video, audio, and specialized software can provide significant value to a Web site. But using them can also create substantial practical challenges.

◆ Although narration is often helpful for people with reading difficulties and sound effects demonstrate audio content, the noise created by one user's computer can "bleed" throughout a workplace and distract other workers in the area. Furthermore, users can typically read a passage to themselves faster than a narrator can, and as a result, they may find narration more of a roadblock than a benefit.

◆ At the time this article was written, regular telephone lines have a limited capacity for transmitting data, a fact that can slow the display of some Web content (large graphics, animation, and video, for example).

◆ In some implementations, users need special software called plug-ins to play video and audio. Some users do not have access to plug-ins, making their use impractical. Even when users have access to plug ins, some experts warn against using them, in

the event that users have difficulty or the image becomes garbled. For example, students of one online university had difficulty viewing online lectures because the intranet from which they worked did not allow plug-ins. For these reasons, some Web gurus like Jakob Nielsen recommend against using plug-in technology.

◆ Some Web site designers like to take advantage of the latest technical improvements to Web technology. Because users are often slow to upgrade their browsers, they might not have access to that technology. For example, when frames were first introduced, designers who wanted to use them immediately had to implement frame and non-frame versions of their Web sites.

Finally, as computing increasingly moves off of desktop and laptop computers and onto other types of devices like mobile phones and personal digital assistants, designs for one type of display increasingly will fail to display effectively on the users' equipment.

8. "ATTENDANCE FIGURES MEASURE MARKETING STRATEGIES, NOT EXHIBITION STRENGTHS."
What I observed in museums
One of the most challenging aspects of exhibit design is assessing its effect on visitors. One common measure used by museums is attendance. In most instances, because most museum admissions let visitors see any exhibit, attendance figures pertain primarily to the museum in its entirety. In these cases, attendance spikes (that is, sudden increases in attendance) are usually attributed to changes in the make-up of exhibits. For example, a spike that follows the opening of a new permanent exhibit is attributed to that exhibit. In some instances, however, museums charge separately for blockbuster temporary exhibits or exhibits located in another facility. In those cases, attendance figures pertain to the separately charged exhibit.

"Wouldn't it be better to judge an exhibition's success—or failure—by attendance figures?" asks Chambers (1999). No, she determines, observing that "attendance figures measure marketing strategies, not exhibition strengths" (p. 31).

According to the American Association of Museums' Standards for Museum Exhibitions, an exhibit is successful if it is physically, intellectually, and emotionally satisfying to visitors. Visitor research is a discipline within the field of museum studies that assesses the impact of exhibitions and their components. Visitor research explores a variety of issues, such as the demographics of visitors to particular types of museums (like science museums), the amount of time visitors spend reading labels, the objects that visitors focus on, the themes that visitors recall from exhibits, and the exhibits that visitors actually go through and the ones

that they ignore. Chambers notes that it is

significant that museum exhibitions began to be a topic for professional discussion just when American advertising was developing into a science. Research into the power of advertising design to attract and hold attention (to sell a product) soon spilled over into the museum world and created new criteria for visual presentations and their power of persuasion. Early visitor studies of the 1930s took their cue from psychological studies about the manipulative techniques of advertising, as many of them still do. (1999, p. 33)

Most of these studies are quantitative and results are used as much to generate design guidelines as to assess effectiveness.

Although they value it in theory, few museums actually have the resources to perform their own visitor research. Certainly the museums in this study did not. Other than attendance figures and evaluations from public programs, the design teams in my study relied almost exclusively on anecdotal evidence to assess the effectiveness of their work. The designers at the high technology museum were the most rigorous, using a form of usability test to assess the effectiveness of proposed exhibits. They would place prototypes of interactive displays in a gallery and observe visitors' interactions with them. In some cases, staff members would also interview visitors to get more specific feedback. They did not apply such rigor to assess the effectiveness of a completed exhibit, relying primarily on comments from feedback forms placed at the end of the exhibit and comments relayed by docents working in the exhibit.

The staff at the urban history museum placed a comment book at the end of its exhibit on the history of the city. Once a month, the idea implementer would record comments from the book and share them with the rest of the exhibit design team. Sometimes visitors to that museum would contact the staff. The exhibit design team generally considered itself to be successful when they received requests from visitors for more information or the opportunity to visit the museum library.

When feasible, museum staffs try more rigorous approaches. The National Aquarium in Baltimore, MD, commissioned a study to assess the long-term impact of an exhibition on visitors. According to Adelman (2000), they wanted to see whether or not the exhibit had a transformative effect on visitors. Paris (2000) noted that transformation results from a combination of process and outcomes that are neither well understood nor documented. The researchers noted that because of the long time frame and high cost of this type of study, few museums can maintain such evaluation programs on an ongoing basis.

Lessons for Web design

Because we can easily do so, it is tempting to report the number of visitors as the measure of effectiveness of a Web site. We even have technology that tells us where visitors come from and where they go when they leave our sites. But as counting attendance at museum exhibits may only measure marketing strategies, so counting the number of visitors to a site may only measure marketing strategies.

Another tempting measure might be measures of system performance (such as the speed of loading) or checklists of usability items (such as the number of links per page or the extent of use of passive voice). But these characteristics only correlate with usability; they do not guarantee either usability or users' ability to perform the tasks for which the Web site was designed.

Only when users can perform the tasks for which a Web site is intended is the Web site successful. If the Web site was designed with clear objectives, then one key measurement of effectiveness is whether users can achieve those objectives. To ensure the long-term success of the Web site, however, it is important to also gauge user satisfaction with the site. If users are not satisfied with the experience of using the Web site, they are not likely to use it in the future if given an alternative.

CLOSING THOUGHTS

Even with the creation of immersive environments, exhibit designers recognize that exhibits are, at best, artificial environments. A room that's been rebuilt inside a museum exhibit is no longer part of a real house. Fire alarms from the 1890s that sit on walls in the exhibits on urban history and networks are no longer working. Exhibit designers acknowledge that one of their main tasks is to give visitors tools to better understand the outside world—not replace it.

Although we recognize that we are creating online communities with our Web sites and especially when we provide opportunities for users to interact with one another online, we too must recognize that online worlds are ultimately artificial ones and that people still need direct, ongoing contact with one another to learn and work.

I learned this in my work also. Although my primary interest was design techniques, what struck me most was the cohesiveness of design teams in this study. In each museum, I observed that the idea generator served as more than the nexus of ideas; this person also served as an informal educator of the team. The idea generator and, in some instances, the idea implementer were the only ones who had personally learned exhibit design for museums. Other team members relied on the idea generator for guiding concepts of design, and terms introduced by the idea generator were used by all members of the design team. For example, the idea generators at the urban and industrial history museums used the term *immersion* as did their

> # Because we can easily do so, it is tempting to report the number of visitors as the measure of effectiveness of a Web site.

staffs. The idea generator at the high technology museum used the term *immersive*, as did his staff.

Similarly, rather than learn about museum studies, exhibit designers in my study often look to other design disciplines for ideas. For example, the designer at the high technology museum relies on his retail experience for ideas.

The enduring lesson that Web site designers can learn from this study is that we must take responsibility for our roles. Not only do we design Web sites for users, but we also provide intellectual and emotional leadership for our entire design teams. T**C**

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