
Production of the next-generation library virtual tour

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While many libraries offer overviews of their services through their Websites, only a small number of health sciences libraries provide Web-based virtual tours. These tours typically feature photographs of major service areas along with textual descriptions. This article describes the process for planning, producing, and implementing a next-generation virtual tour in which a variety of media elements are integrated: photographic images, 360-degree "virtual reality" views, textual descriptions, and contextual floor plans. Hardware and software tools used in the project are detailed, along with a production timeline and budget, tips for streamlining the process, and techniques for improving production. This paper is intended as a starting guide for other libraries considering an investment in such a project.

INTRODUCTION

The Hardin Library for the Health Sciences is a four-story building of nearly 60,000 square feet seated in the heart of the University of Iowa's Health Sciences Campus. The library serves the Colleges of Dentistry, Medicine, Nursing, Pharmacy, and Public Health; the University of Iowa Hospitals and Clinics (including related allied-health education programs); and the Department of Speech Pathology and Audiology.

A short history of our work with virtual reality

In 1996, following the construction and opening of its Information Commons [1], staff members began working with Apple Computer's QuickTime Virtual Reality (QTVR) by producing "immersive imaging," panoramic representations of selected facility areas, such as the electronic classroom and the multimedia production stations. These "virtual views" allowed users to click and pan 360 degrees to look around a space. The facility's first Web-based virtual tour [2] was a combination of virtual views, a classroom floor plan, and descriptions of services and hardware. It was produced to provide Web visitors with a sense of the space, layout, and interior design of the facility, along with information about resources available to its patrons. A subsequent revision in 1998 incorporated a Java-based alternative for interacting with the virtual views.

Also in 1998, concurrent with the construction of the Information Commons' west wing, staff members periodically shot and created panoramas in the midst of the renovation and building activity. The result was a series of immersive, virtual views, all shot from the same locations but spanning across time. These virtual views were maintained in a QTVR format and integrated in a Macromedia Director production, detailing with text and images some of the architectural and design features of the expanded educational technology facility.

In 2000, Hardin Library staff members decided to produce a larger-scale tour based on experience with the Information Commons Virtual Tour and user feedback from that tour. In the two years since the revision of the online virtual tour, Web technologies had advanced to a point where staff members were confident they could improve on the model, the process, and the implementation of the tour. The project involved one full-time professional Web producer, a part-time student assistant, and less than three hours of technical input from a multimedia specialist.

PURPOSE AND TARGET AUDIENCE

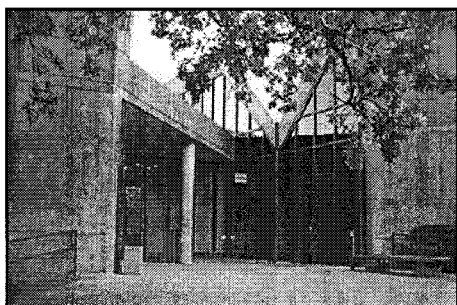
Produced in approximately forty-five hours during a ten-week period (late May to early Aug 2000), the Hardin Library Virtual Tour* is a series of Web pages dis-

* The Hardin Library Virtual Tour may be viewed at <http://www.lib.uiowa.edu/hardin-www/tour/>.

Figure 1
Hardin Library Virtual Tour Web page



Virtual Tour



Welcome to the Hardin Library Virtual Tour

To begin the guided tour [click here](#)
or select a location from the box below:

Select a Location

The Hardin Library Virtual Tour takes approximately 10-15 minutes to complete.

Hardin Library for the Health Sciences
800 Newton Rd, University of Iowa, Iowa City, IA 52242
Copyright (c) 2000-2001. The University of Iowa. All rights reserved.
Hardin home: <http://www.lib.uiowa.edu/hardin>
Please send comments to: lib.hardin@uiowa.edu [3089]

playing photographic images, virtual views, textual descriptions, and floor plans of the library's service points and collections (Figure 1). The tour supplements the orientation activities and user-education workshops offered by Hardin Library staff and allows users to become oriented to the library at their convenience and at their own pace.

Hardin librarians every year provide tours to approximately 1,000 students, staff, and faculty members as part of the curricula of the health sciences colleges or as regularly scheduled workshops. Staff members believe there are many other users who never tour the building and therefore may not be using the library in the most efficient manner. Because of the confusing physical layout of the library (with its collections spread out on four levels due to the building's unique architecture), some kind of orientation for first-time patrons is almost a necessity. Providing tours to users on a drop-in basis is not always practical or feasible for library staff, especially during the evenings or weekends when staffing is at a minimum. The Web-based virtual tour allows staff members to offer an alternative to the time-consuming physical tours when an on-the-spot tour is not practical, while providing users with an easy and enjoyable way to learn about the library.

Orientation sessions for students in the various health colleges at the beginning of every semester include a lecture on library services, a tour of the building, and demonstrations of the online catalog and var-

ious bibliographic databases. Instead of physically leading a large group of students through four floors of the library in the short time allotted for these sessions, librarians are able to display the virtual tour and describe some of these service areas during the lecture session. By spending less time on the physical tour, more time is available for bibliographic instruction.

The virtual tour is also beneficial for distance education students, who may be on campus only a few times each semester. The time these students are able to spend in the library is very limited, so the students' ability to tour the library in advance and familiarize themselves with the services offered can be a timesaver.

SURVEY OF ONLINE VIRTUAL TOURS

Curious about how many other health sciences libraries have produced similar virtual tours and seeking to compare navigational schemes, library staff members conducted an informal survey. Two Web-based library directories, considered the most comprehensive link lists, were used: Hardin MD's Medical/Health Sciences Libraries on the Web [3] and the National Library of Medicine's Medical Research Libraries by State [4]. The Websites for all libraries listed in these two resources were checked in July 2000 for availability of a virtual tour. Hardin MD's list included seventy-eight libraries outside the United States (Canada, Australia, United Kingdom, Germany, and others). These seventy-eight were included in the survey.

Table 1
Health sciences libraries featuring online virtual tours

Library and location	Virtual tour URL
Lister Hill Library of the Health Sciences, University of Alabama, Birmingham	http://www.uab.edu/lister/virttour.htm
Charles M. Baugh Biomedical Library, University of South Alabama, Mobile	http://southmed.usouthal.edu/library/tour/
Lane Medical Library, Stanford University Medical Center, Stanford, CA	http://www-med.stanford.edu/lane/general/tour/virtour.html
Denison Library, University of Colorado Health Science Center, Denver	http://www.uchsc.edu/library/tour/
Dahlgren Memorial Library Georgetown University, Washington, DC	http://www.georgetown.edu/dml/tour/dml.tour/dml.welcome.htm
Galter Library, Northwestern University, Chicago, IL	http://www.galter.northwestern.edu/guided_tour/
Hardin Library for the Health Sciences, The University of Iowa, Iowa City	http://www.lib.uiowa.edu/hardin-www/tour/
Library, Alton Ochsner Medical Foundation, New Orleans, LA	http://www.ochsner.org/library/tour/tour1.html
William H. Welch Medical Library, Johns Hopkins University, Baltimore, MD	http://www.welch.jhu.edu/about/tour/welch.htm
Learning Resource Center, Uniformed Services University of the Health Sciences, Bethesda, MD	http://lrcgwf.usuf2.usuhs.mil/tour/lrctour.html
Countway Library of Medicine, Harvard University, Cambridge, MA	http://www.hms.harvard.edu/countway_tour/
Dental Library, University of Michigan, Ann Arbor	http://www.lib.umich.edu/dentlib/services/gds/tour.pdf
J. Otto Lottes Health Sciences Library, University of Missouri–Columbia	http://www.muhealth.org/~library/docs/libfloors.html
Health Sciences Library, University of Missouri–Kansas City	http://www.umkc.edu/lib/hsl/hsltour.html
Bernard Becker Medical Library, Washington University School of Medicine, St. Louis, MO	http://128.252.223.45/tour/
Edward G. Miner Library, University of Rochester, Rochester, NY	http://www.urmc.rochester.edu/Miner/QTVRTour/
Augustus C. Long Health Sciences Library, Columbia University, New York, NY	http://cpmcnet.columbia.edu/library/tour/
Library, Duke University Medical Center, Durham, NC	http://www.mc.duke.edu/mclibrary/about/lower.html
Library, Oregon Health Sciences University, Portland	http://www.ohsu.edu/library/virtual/
Health Sciences Library, West Virginia University, Morgantown	http://www.libraries.wvu.edu/tour/health/
Neil John Maclean Health Sciences Library, University of Manitoba, Winnipeg, Canada	http://www.umanitoba.ca/academic.support/libraries/units/health/tour/

Of the 260 checked libraries, approximately twenty-one (8%) provided some kind of virtual tour (photographic images or clickable maps). At the time of the survey, two provided virtual views. As of the writing of this article, the University of Rochester's Edward G. Miner Library, Washington University's Bernard Becker Medical Library, and the authors' own Hardin Library were the only three libraries to offer virtual tours with virtual views. The first used QTVR for its views, while the second used Internet Pictures Cor-

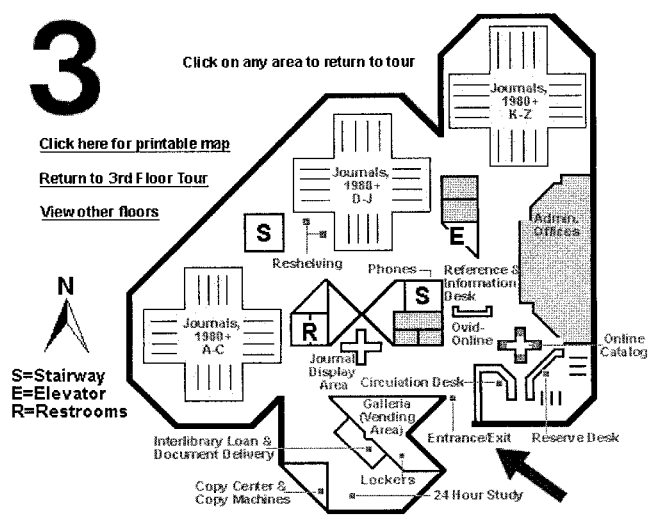
poration's iPIX, a competing technology. Both required that users either had pre-installed plug-ins or system software to function properly. Hardin Library offered Java-based views, which did not require a browser plug-in.

Table 1 lists the twenty-one health sciences libraries featuring online virtual tours, along with uniform resource locators (URLs) for those tours. By and large, most library virtual tours offer navigational interfaces or guided tours based either on physical walking tour routes or linear floor-by-floor navigation. Dahlgren Memorial Library's tour at Georgetown University is notable in that it features an interface based on an elevator button panel. Users click to go from floor to floor and are delivered a floor plan map marked with bullets that, when clicked, loads new pages with photographs of the relevant areas. Overall, it simplifies users' experiences and provides a good context for where virtual visitors are located in the library.

ADDED VALUE: CONTEXTUAL FLOOR PLAN MAPS

While virtual views and photographs provide a sense of space for specific locations and service points, staff members at Hardin Library believed that to truly aid Web visitors in orienting themselves, they need a larger perspective. To that end, multiple versions of floor plan maps were designed. Users can see where a given service area is located in context with the rest of the floor when reading about that area, when seeing a photograph of the area, or when interacting with a virtual view of the area (Figure 2).

Figure 2
Hardin Library floor map



The process for creating these floor plan maps was tedious. An existing printed floor plan of the overall library was scanned. Stray marks and smudges were cleaned up using Macromedia Fireworks, and the image was saved as both graphics interchange format (GIF) and portable document format (PDF) files to offer users two printing options. Next, the overall floor plan image was cropped to create a separate image for each floor. Each of the four images was enlarged to fit best within an 800- \times -600 monitor display resolution. Staff members chose this resolution as a typical "minimum" configuration.

Each of the four floor plan maps was enhanced with color and supplementary labels. A copy of each map was saved for every area of the tour, and an arrow was placed on each of these maps indicating that area's location. As a result, a total of twenty-eight floor plan maps were created. When visitors view a particular area of the library, they can click the "location on map" button at the top of the screen and see precisely where that service area is located.

In addition, Macromedia Dreamweaver was used to produce clickable image maps for each floor plan. These image maps allow users to click on certain sections of the image ("hot spots") and jump to the corresponding area of the tour. Because the image maps are part of the hypertext markup language (HTML) document and not the image itself, it was only necessary to create one image map for each floor, then replicate the image map to each HTML document featuring a specific area. In other words, instead of creating twenty-eight image maps for each image (each of the 28 floor plan maps), only one for each floor was needed.

WEB DESIGN SPECIFICS

Creating a tour with a neat, clean, and consistent appearance; with a simple navigation design; and with a flexible layout that would accommodate a variety of computers and browsers was a top goal for the project. The tour can be navigated in two ways: either with a linear and structured path or with a user-directed, hypertext approach. In the latter approach, users can jump around by selecting locations from a JavaScript dropdown menu or by clicking on floor plan map hot spots. In addition, a site index was created as well as an index of images to allow users alternate ways to navigate the tour.

The linear, guided tour approach was designed based on the actual physical tours conducted by library staff members. The outline used for the physical walking tour of the library was reviewed with a particular focus on the areas of the library that are heavily used (service desks, key collection locations, etc.). Text was then written for each of these areas and, from this text, a flowchart was created. The tour interface in-


cludes two buttons for stepping through the tour linearly. Users click on either the "next" button or the "back" button (either the back button within the tour interface or the browser's back button) to progress to the next or previous stop in the tour.

The JavaScript dropdown menu is organized by floor with the same tour hierarchy to provide continuity but allows users to move freely to any stop in the tour. Because dropdown menus can be created without the "Go" button (a technique that results in an immediate jump to the selected page when users click a link), staff members needed to decide which approach to adopt. The "Go" button is provided, because some novice Web users become confused or disoriented if they select an item from a dropdown menu and are immediately whisked away to the next page, particularly if their mouse skills are not well honed. By providing a two-click process for navigating, users can choose which area to link to and be confident that the selection was accurate—it stays displayed until the "Go" button is clicked and a new page is loaded. To create the dropdown menu, we used an EchoEcho.com tool, which promised to generate JavaScript compliant with Netscape and Internet Explorer browsers version 3 and higher [5].

The JavaScript dropdown, created as a separate, external file, is not included in each HTML document on the tour site. A "server-side include" within the site's HTML documents provides instructions to the server to include this external file on the page. Staff members reason that if a link needs to be added or removed from the list, the external dropdown menu file is the only file that needs updating. Any changes made to this external file will be displayed on each HTML document that references the file. Using server-side includes, if users' Web servers are configured to support them (many are), can be an enormous timesaver. Server-side includes can be used for graphics, text, or any file repeated on multiple pages on a site and are especially useful for headers or footers.

Because the focus of each tour page is a picture of the location, the design and the rest of the graphics are kept as simple and clean as possible. The navigation elements, colors, and fonts are consistent from page to page. Colors are derived from the 216-color, "browser safe" palette (though these days, there is debate about the real viability of this Web-safe palette [6]), and the background is white. Each page of the tour includes the virtual tour graphic, a link back to the tour home page, a link to the contextual floor plan, "next" and "back" navigation buttons, and the JavaScript drop down menu. When a tour location also offers an immersive panorama, an additional icon and the words "virtual view" appear as a link (Figure 3). The page orientation is horizontal, a design that accommodates the majority of monitor sizes and screen resolutions. The tour has been created to fit comfort-

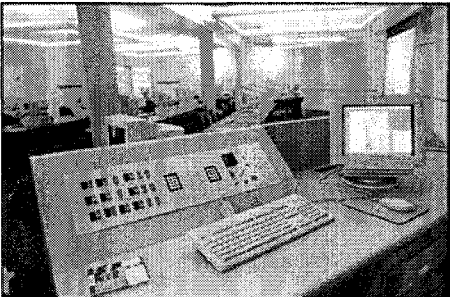
Figure 3
Sample tour page showing Virtual View icon




Hardin Library for the Health Sciences
The University of Iowa

Virtual Tour

home
location on map
back
next



Commons East Classroom

 **Virtual View**

Information Commons East Classroom

Information Commons Go

A networked electronic classroom is available for hands-on group instruction. The classroom easily seats 50 students, with access to 25 workstations. The instructor's station features computer and video projection, and a stereo system. Another electronic classroom is located in the the [Information Commons West](#).

See: [Requesting the Electronic Classrooms](#) for more information.

[View a detailed floorplan.](#)

ably on a monitor displaying 640- \times -480 resolution with a minimum of scrolling, but 800 \times 600 dots per inch or higher is the preferred resolution for the maps pages. Overall, staff members have attempted to design a tour that utilizes some of the latest technology, while providing compatibility for users with lower-end machines, all in a simple, clean interface.

TECHNOLOGIES USED IN PRODUCTION

One of the unique characteristics of the Hardin Library Virtual Tour is that it offers photographic images that escape flatland. Often referred to as "immersive imaging" or "panoramic virtual reality" (VR), this type of media virtually replicates the physical environment by allowing users to pan and zoom. Added-value panoramic imaging files offer another function: the ability to click hotspots in the virtual view to jump to other virtual views or to target other Web pages (or Web page frames) that may contain additional text information and media (video, audio, animations, etc.).

The Hardin Library Virtual Tour features panoramic VR at its most basic. Web visitors can click and pan 360 degrees to look around the area featured on that part of the tour. Each virtual view is delivered in CylPan, a Java applet, though the parameters for that particular virtual view can be set directly in the HTML code for the page. Typical parameters include the height and width of the virtual view, the thickness of the border frame, the message text that appears at the bottom of the browser window, and the source

panoramic image (in JPEG format) referenced by the applet and rendered to users. In the implementation of the applet on each virtual view page, staff members have included alternate images and text to deliver to users if there is a problem with the applet loading or if Java has been turned off in the browser. When the virtual view loads successfully, it begins to pan automatically, drawing the users' attention to the idea that what they are viewing (and what they can interact with) is no ordinary photo.

While superior image quality and functionality can be achieved in the delivery of panoramic VR with file formats like Apple's QTVR[†] and iPIX[‡], a drawback to Web visitors' ability to view those files is that additional software or browser plug-ins need to be installed. Because the default for installation on most browsers is to have Java turned on (and many Web users are not even aware that Java is active in their browser), a Java-based delivery mechanism means that users would not need to fuss with software installation. Theoretically, our virtual views would simply work automatically for a majority of the users accessing the tour.

The process

A discussion of specifics for how to create panoramic VR media would be inappropriate for this article, how-

[†] Information about QuickTime VR may be viewed at <http://www.apple.com/quicktime/qtvr/>.

[‡] Information about iPIX may be viewed at <http://www.ipix.com>.

Table 2
Tools used in the production of a next generation virtual tour

Product	Use	Type	Estimated Cost	Vendor URL
Dreamweaver/Fireworks Studio	Web authoring and production	Software	\$450	http://www.macromedia.com
Photoshop	Image editing	Software	\$600	http://www.adobe.com
QuickTime VR Authoring Studio	Panorama image stitching	Software	\$400	http://www.apple.com/quicktime/qtvr/
CylPan vl.2x	Java applet	Software	\$80	http://www.nemeng.com/java/
Kiwi+ and Quick Tilt Leveler	Panoramic head for controlled rotation	Hardware	\$400	http://www.kaidan.com
Bogen Manfrotto tripod	Stable base for photography	Hardware	\$200	http://www.bogenphoto.com
Kodak digital camera	Image capture	Hardware	\$800	http://www.kodak.com
Total			\$2,930	

ever it may be useful for other libraries considering this type of project to understand the basics of the production process.

- Start with a floor plan map. Walk around the library to scout out potential locations for 360-degree views. Avoid shooting such a view right next to a wall, unless that wall sports a visually interesting work of art. Mark designated locations on the map.

- Assemble the equipment: camera or cameras and lenses, tripod, panoramic tripod head, bubble level, and so forth.

- Go to the designated locations, set up the equipment, and begin shooting. Basically, source images for the final panoramic image are captured when shooting and rotating (and shooting and rotating. . .) until greater than 360 degrees has been covered. When shooting, there must be overlap for the images. Go to the next designated location and continue.

- If using film, send it to a reputable local developer. Each of the photographs will then need to be scanned on a flatbed scanner, or a photo-CD will need to be created from the film. If using digital photography, offload the photo files into an organized hierarchy of directories.

- Use a software package to "stitch" the photos. Stitching software packages such as QuickTime VR Authoring Studio typically prefer 38% to 50% overlap for images in order to match the edges of the photos seamlessly. The output will be a very long (wide) panoramic image.

- Is it seamless? No panoramic image is ever perfectly seamless. Expect to do touchups to panoramic images using a program like Adobe Photoshop. If using a QTVR format, the image will need to be reimported into the stitching software, then exported as a QTVR file. If using a Java-based viewer (as the authors did), the final cleaned-up panoramic image is exported from Photoshop as a joint photographic experts group (JPEG) format file, which the Java applet uses as its source for rendering the virtual view within the Web browser.

- Author the virtual tour Web pages, incorporating all of the assembled content (text, images, and applet-delivered panoramas).

- Test and fix errors. The tour's functionality should be tested on a variety of computers, connection speeds, monitors, and Web browsers. While some link checking can be done with software (particularly to find dead links), hand checking the links will ferret out problems where links point to "some" page, but not the "correct" page.

- Unveil the virtual tour to the world. Advertise and announce through electronic and print distribution channels as appropriate. Solicit feedback. Make changes where practical.

Digital versus film photography

With access to a digital camera that produces quality indoor images, the process can go significantly quicker than with a film camera. A mega-pixel camera, in particular, can produce images that offer more than enough resolution with which to work. In addition, the target for distribution is a computer monitor, so the same kind of resolution needed for high-quality print publishing is not needed. Having the ability to shoot a location and then download images from the camera, stitch together the images, and process the final panoramic file all in the same day helps provide continuity for the project. If dissatisfied with the results, returning to the location (or slightly different location) and reshooting the scene is easy.

Using traditional film photography offers some benefits, however. With a thirty-five-millimeter camera that provides manual aperture and shutter speed control, staff can shoot without a fill flash or, depending on the location, without any flash at all. By lowering the shutter speed and having the camera mounted on a tripod, the camera's controls can be set so that depth of field is better and a cable release can be used. The major drawback to traditional film photography is the time delay, not only in processing the film but also in having to scan the prints. Ordering a photo-CD may be a good option if a library does not have access to a quality flatbed scanner.

Tools, costs, and time estimates

Table 2 details the hardware and software tools used in the production of the Hardin Library Virtual Tour.

Because Hardin Library already owned some of the hardware used in the project (items like the digital camera and the specific pano head are no longer manufactured), updated equivalent hardware pieces are listed in the table. Costs reflect list prices, so no educational discounts are applied. Also, we did not add in the cost of a multimedia-authoring personal computer, assuming that most libraries have an existing Windows or Macintosh computer that can be used to perform the work. While Table 2 indicates the types of tools Hardin staff members used, there are a variety of competing Web authoring, image editing, and panorama stitching software tools on the market. There are also a variety of hardware options. A good starting list of VR-related product vendors, reviews, and even technique guides directed at novices can be found at panoguide.com.§

The project consumed approximately forty-five hours of staff time between late May and early August 2000. It would be safe to estimate more time if a library's staff had no prior experience with the technologies involved in this kind of production. All of the members of the Hardin Library team had two or more years of experience either with Web authoring, panoramic imaging, or some combination, and the hardware and software was already on site at the Information Commons. The following breakdown of estimated time for tasks includes everything from planning to final testing and delivery of the site.

- project planning: four hours
- still photography: four hours
- panoramic imaging, stitching, and file preparation: twelve hours
- preparation of floor plan map images: ten hours
- site design, organization, and revisions: five hours
- content generation and conversion—text, images, and navigation: five hours
- site testing and link checking: five hours

Although some of the project work was performed by a student assistant from the Information Commons, the authors estimated staff costs at an average of \$30 per hour, or \$1,350 total. Adding in hardware and software totals, the estimated project cost ended up at approximately \$4,300.

FINAL NOTES AND CONCLUSION

The Hardin Library Virtual Tour includes forty-eight still images, nine virtual views, and a variety of floor plans and takes approximately ten to fifteen minutes for Web visitors to complete. There are relevant links within the tour to other pages on the Hardin Library Website detailing additional information about courses

and workshops, facilities, and resources. The last page of the tour includes a form for user input and contact information if users wish to request physical tours of the library.

In the first two months following its release, the tour received more than 1,600 visitors, and the unsolicited comments have been very positive. The availability of the tour was announced on local and national email discussion lists, and links were added from various Hardin Library Web pages. As of late April 2001, more than 3,000 visitors have viewed the tour.

We hope to make the tour more visible to our clientele by better integrating the tour as a component of our user-education and library-orientation sessions and by expanding our marketing efforts. We plan to display the tour more prominently on the library's home page, feature the tour on the desktops of our reference workstations, promote the tour during meetings with faculty and other user groups, and announce the availability on local email discussion lists. We also will include the URL on library handouts and other printed documentation, work with the library's public relations committee to better promote the tour, and possibly place a dedicated station near the entrance of the library.

There are several decision points that might have changed the tenor or quality of this project, for better or worse. First, we did not consider outsourcing the panoramic imaging parts or the Web production work. The benefits of this decision include reduced costs, valuable experience gained by internal staff members, and considerable reduction in time spent because decisions by the project manager could be made on the fly. The benefit to outsourcing would be better image quality for the VR views because of the specialized equipment professionals would provide.

Second, we did not conduct an exhaustive interface usability study to determine the best method for presenting the tour content, and instead relied on our in-house knowledge of Web interface design and navigation strategy and a survey of how other organizations had presented similar content. The drawback to not performing a usability study was that staff members were too close to the product and could not be absolutely objective. Only a true study would prove definitively whether the content, design, and navigation schemes are easy to use and enjoyable for our viewers. We also did not conduct a user satisfaction survey but instead relied on the comments-and-suggestions form included within the tour.

A byproduct of the unveiling of the virtual tour has been the library's heightened visibility among a few departments on campus. Within the first two months of the tour's release, staff members from three departments contacted the library to inquire about the process and requirements for creating, in particular, immersive virtual views. These departments were inter-

§ Panoramic Photography Technique by [panoguide](http://www.panoguide.com) may be viewed at <http://www.panoguide.com/technique/>.

ested in creating their own Web-based tours. Such contacts have resulted in library staff members providing consultations about site design and organization, as well as highlighting the availability of Information Commons hardware and software for use by the campus community.

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