Development of the Pacific University College of Optometry web site

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Abstract
A World Wide Web site was developed for Pacific University College of Optometry as part of a student thesis project. The development began with a definition of the target audiences for the site and proceeded to the creation of actual Web pages. Total development time for the site was about 6 months of part-time work that included learning the Hypertext Mark-up Language (HTML) coding language, soliciting page materials from a variety of sources, and placing the site materials on the Pacific University host computer. An additional 6 months was spent modifying the pages, soliciting additional materials, and responding to e-mail questions received through the site. The success of the site is indicated by the fact that there were over 4,500 visitors during the first 12 months of operation. Estimates of development time required to produce the site indicate that each visit cost about $1.90 and that maintenance costs for the second year of operation will range from about $0.91 to $1.30 per visit. These costs are for personnel only and do not include computer hardware or telephone line expenses.

Degree Type
Thesis

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DEVELOPMENT OF THE PACIFIC UNIVERSITY
COLLEGE OF OPTOMETRY
WEB SITE

By

Lisa A. Groth
Nina M. Pasin

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
May, 1997

Adviser:

Robert L. Yolton, PhD., O.D.
Biography Page

Nina M. Pasin was born and raised in Trail, British Columbia. She attended the University of British Columbia in Vancouver, where she earned a Bachelor of Science degree in general biology in 1990. After a brief hiatus, Nina entered Pacific University in 1993. At Pacific she acted as treasurer of Beta Sigma Kappa, SOA Entertainment co-chair and a member of Phi Theta Upsilon. Nina was also an active member of Amigos Eyecare and participated in missions to Tangarang, Indonesia and La Ceiba, Honduras.

Upon graduation Nina plans to practice primary care optometry in Anchorage Alaska.

Lisa A. Groth graduated from Kansas State University, Manhattan, Kansas in 1988 with a Bachelor of Science in Business Administration. She was self-employed as an internal auditor for a consulting firm for two years in Dallas, Texas and Chicago, Illinois. Lisa entered Pacific University College of Optometry in 1993. She has been actively involved in the Student Optometric Association as treasurer and Amigos Eyecare participating in a trip to Merida Mexico. Lisa graduates with her doctor of Optometry in May 1997 and plans to pursue private optometric practice in Texas.
Abstract

A World Wide Web site was developed for Pacific University College of Optometry as part of a student thesis project. The development began with a definition of the target audiences for the site and proceeded to the creation of actual Web pages. Total development time for the site was about 6 months of part-time work that included learning the Hypertext Mark-up Language (HTML) coding language, soliciting page materials from a variety of sources, and placing the site materials on the Pacific University host computer. An additional 6 months was spent modifying the pages, soliciting additional materials, and responding to e-mail questions received through the site.

The success of the site is indicated by the fact that there were over 4,500 visitors during the first 12 months of operation. Estimates of development time required to produce the site indicate that each visit cost about $1.90 and that maintenance costs for the second year of operation will range from about $0.91 to $1.30 per visit. These costs are for personnel only and do not include computer hardware or telephone line expenses.

Key Words: World Wide Web, Web site, computer, Internet, optometry, education
Introduction

One of the hottest new computer applications involves accessing the World Wide Web (WWW). Despite overloads and access problems, millions of people now use the Web via the Internet on a daily basis searching for information on subjects ranging from sex and stock prices to the latest shoe styles. Many have predicted that within a few years the Web will evolve to become a grand combination of the Yellow Pages, catalogs for most companies in the world, encyclopedias, and chat lines focusing on every topic imaginable.¹

With the rapid development of the Web, many potential students, including those interested in optometry, are beginning to inquire about educational programs electronically. Equally apparent is the need for potential patients, practicing optometrists, and even current students to have access to information about developments in optometry and optometry school programs in an immediate access format. For these reasons, two third year optometry students at Pacific decided to create a Web site for the College of Optometry.

This paper presents a brief discussion of the World Wide Web followed by a description of how Pacific's site was created. It also outlines some of the problems and unexpected costs associated with site development.

History of the Web

The WWW "lives" on a group of computers collectively known as the Internet.² (See the Glossary of Internet-related Terms.²,³) The Internet had its early origins during World War II when a computer system was devised to aid in the analysis of military data.⁴,⁵ After the war, this computer network continued to evolve due to the need for reliable communication in the event of a nuclear attack. In theory, missile sites, command centers, and other military installations could all be interconnected in a spider web configuration so that if any sites were destroyed, communication would still be possible between those remaining.²,⁶,⁷

The summer of 1969 marked a turning point in the development of the Internet when four host computer sites were linked together by the Department of Defense's Advanced Research Project Agency (ARPA) to form a computer network called ARPANET. This network enabled
researchers around the country to communicate with each other using the web configuration so that if one connection was disrupted information could still get through via other web pathways.\(^7\)

During the 1970's, the net grew into an international presence as electronic mail, file transfer, and remote log-in capabilities were implemented.\(^8\) As development of the ARPANET continued, it became increasingly dominated by university researchers who found it to be an extremely valuable research and communication tool.

The 1980's was also a significant decade for the evolution of the net, in part because funds were supplied by the National Science Foundation to provide many more university scientists access to ARPANET. In 1984, the National Science Foundation networked five super-computer centers to form a host for the network that was called NSFNET.\(^8\) By the late 1980's, essentially anyone with a computer modem could connect to this net.

Starting in 1990, several existing networks were "internetworked" to form what has now become known as the Internet. In 1991, the ban on commercial traffic was lifted, and this contributed to the Internet's explosive growth. It is impossible to determine the number of users actually on the Internet at any one time, but the number is estimated to be in the tens of millions.\(^8,9\)

Perhaps a better representation of the Internet's growth is provided by considering the number of host computers that provide services on the net. This number has grown exponentially over the past thirty years.\(^9,10\) (Table 1.)

### Insert Table 1 About Here

<table>
<thead>
<tr>
<th>Development of the College of Optometry Web Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>With its large and international presence, the WWW is becoming the perfect vehicle to present information to a resource hungry world. Specifically, it provides an ideal way to communicate with computer literate individuals who might be interested in what is happening at Pacific University College of Optometry. For this reason, a College of Optometry Web site has been created. In designing the site, several target</td>
</tr>
</tbody>
</table>
audiences were defined and determinations were made about what kinds of information would be of most interest to them. (Table 2.)

Based on these determinations, a multi-tiered page configuration was established. The user begins by selecting from broad topics of interest within which access more specific data is provided. The first page of the site, often referred to as the home page, contains graphics illustrating the College of Optometry building and provides menu choices for links to the sub-page sets shown on the Web site flow chart. (Figure 1.) The home page can be found at URL address: http://www.pacificu.edu/up/opt/opt_home.html

Academic Programs

The Academic Programs page set is divided into three sections. The Curriculum and Catalog pages contain names, numbers, and descriptions of all the courses in the college curriculum. The Academic Calendar page provides the current yearly calendar of scholastic events and school holidays, and it will eventually contain projected calendars for the next four years. Access to these calendars will allow students and faculty members to plan trips, vacations, and other activities several years in advance. The third page set in this area is called Areas of Optometric Interest and contains multiple sub-pages. These sub-pages are have been partially completed as the result of another student thesis project. When they are done, they will provide an informative, illustrated orientation to many optometric subjects including contact lenses, vision enhancement, disease management, and independent-study thesis projects being conducted at Pacific.

Faculty

Faculty members were given the opportunity to create their own Web pages containing information about their interests, qualifications, course outlines, areas of research interest, and pictures. The goal was to allow prospective students to see each faculty member as both a professional
and as a "real" person to whom the students could relate. Submissions were prepared by faculty members and HTML coding was added as part of the thesis project.

Several faculty members created very interesting pages, but the majority were reluctant to write about themselves. They indicated, however, that they would be happy to have their information included on the site if someone else would prepare their pages. Perhaps out of fear of being placed on electronic junk mail lists, a few faculty members declined to participate at all in the project and requested that neither their pictures nor their e-mail addresses be shown on the site.

**Clinics**

Currently this section consists of basic data regarding the college clinics. Patients can find information on how to contact the various clinics and their hours of operation. In the future, this section will have maps, directions to the clinics, pictures of the facilities, and lists of services provided. Eventually, it might be possible for patients to schedule appointments and submit history information to the clinics online.

**Student Life**

This has been one of the more popular page sets. The area is subdivided into sections on Optometric Clubs and Organizations, links to other WWW Optometric Sites, a Weekend Guide, and the Portland Weather. The Clubs and Organizations pages give information submitted by several of the student organizations affiliated with the college. The optometric link page provides WWW links to vision care-related sites including those at other optometry schools, state and national optometric associations, and international groups. The Weekend Guide provides links to Web sites that give information on local and regional places of interest. Specific links are provided for information on local skiing conditions, wineries in the area, etc. The Portland Weather link gives an area forecast so that students and relatives who are away from campus can check on the Forest Grove weather.

This page set has been relatively easy to maintain because the optometry clubs and external sites take care of their own updates.
Optometric Practice

The Optometric Practice pages are divided into two sections. In the Practice Opportunities section, a bulletin board on which practicing optometrists can advertise openings and new graduates can post their job interests will eventually be presented. The bulletin board has been created but has not yet been implemented while several policy matters are being resolved. In concept, the bulletin board would be fully open so that anyone visiting the Web site could post information. The open posting plan has raised issues about who would police the bulletin board for misleading or false information and how long material could be left on the board. It is expected that these issues will be resolved and that the bulletin board will become available in the near future.

The Practice Management News section features articles on managed care, practice management computer systems, and similar topics.

Alumni News

Like most schools and colleges of optometry, Pacific sends newsletters to its alumni. Because the production and distribution of these newsletters is quite expensive, in the future the newsletter could be published on the Internet. A transition period would be needed during which both paper and electronic publishing would be required, but ultimately the paper version could be phased out.

An announcement bulletin board has been implemented so that alumni can post notes about significant developments in their lives and practices. This is not an open board and information must be sent to the college for placement on the bulletin board. To date, only a few alumni have submitted material but the number should increase as more doctors become familiar with the Web site.

Originally it was planned to have electronic access to the College alumni mailing list through this site location, but unresolved privacy issues have put this plan on hold.

Hot Topics and Special Events

This section includes three page sets. The Special Events pages provide information on the Jefferson Hall Renewal project and describes future special events. The What’s New pages are designed to feature reports about new books, equipment, research, etc.; this page set is currently under construction.
Continuing Education

This link on the College of Optometry home page takes visitors to the Pacific University Continuing Education home page. This page provides information on continuing education programs offered by Pacific and is maintained by the Continuing Education Department of the University.

Optometry Admissions

The final link on the optometry home page is to the Optometry Admissions home page which, in turn, links to the Pacific University Graduate Admissions pages. These pages provide information to prospective students on tuition, prerequisites, and application procedures. There is also a special welcome message from the Dean on these pages which are maintained by the Admissions Office.

Implementation of the Web Site

The Web site went on-line in March 1996 following a one month beta test during which viewing was restricted to an audience consisting primarily of faculty members and administrators. Actual implementation of the site was done by Pacific University Information Services with the Web pages currently residing on a Sun Sparc 20 host computer maintained by Information Services. At this time, all page changes must be submitted to Information Services for incorporation into the existing site. Future plans call for the site to be transferred to a computer within the College of Optometry.

To measure utilization of the Web pages, two visitor counters were inserted. One is located on the home page and counts each visitor to the site. The second counter is much deeper in the site and counts the number of visitors to a single faculty member's page. During the first 12 months of operation, over 4,500 visits (more than 12 per day) were made to the home page and over 150 visitors went deeply enough into the site to register on the faculty member's counter. In the future, more counters will be placed within the site so as to provide additional feedback on specific areas of interest and importance to visitors.

Site Development and Maintenance Costs

Although the Web site was created by students at minimal expense to Pacific University, estimates can be made of costs that would have been incurred had the site developers been paid. In making these estimates, it is assumed that the developers were paid $15 per hour
including fringes and that faculty members who supervised the project and contributed pages were paid $40 per hour including fringes.

During the first 12 months of the project, the developers spent an estimated average of 24 hours per month enhancing their HTML coding skills, writing and coding pages, soliciting materials, scanning graphics, evaluating other sites, and obtaining feedback from faculty advisors. During this same period, faculty members spent an estimated average of 7 hours per month on project supervision, writing Web pages, and editing potential site materials. Based on these estimates, the total cost for site development and operation during the first year would have been about $7,680 excluding computer hardware and telephone line charges. (Table 3)

The cost per visitor can be determined by assuming that about 500 of the 4,500 visits were made during development and maintenance of the site; the remaining 4,000 visits would therefore have cost Pacific about $1.92 each if the developers had been paid.

Insert Table 3 About Here

In addition to first year expenses, the site will have to be maintained\textsuperscript{11,12} which will involve updating calendars, making faculty page changes, soliciting additional pages, adding new features such as an electronic journal, maintaining the bulletin boards, adding new features, etc. It is estimated that the second year of site operation will require an average of 12 hours per month of staff time and an average of 5 hours per month of faculty time. If 3,500 visits are made to the site during the second year of operation, the cost per visitor would be about $1.30; if there are 5,000 visitors, the cost would be about $0.91 each.

To place these figures into perspective, the Pacific University Admissions Office estimates that it costs about $3.00 to print and send an initial brochure and letter to a potential optometry student and about $9.00 to send complete application materials including a view book and a catalog. A considerable cost savings would result if potential students could obtain this same information via the Web site.

In addition to potential students, presumably many of the site visits were made by optometrists who obtained useful information about Pacific, and by members of the public whose understanding of optometry
has been enhanced as a result of their site visit. These public relations functions of the Web site have a significant value to the college.

Future Developments

The future of the World Wide Web is uncertain only because it is difficult to predict what changes will occur in computer technology. Most people, especially those in the younger generations, are now sufficiently computer literate to use the Web, and new equipment promises easy Web access via inexpensive add-ons to television sets. Certainly there are problems with system access, search engines that return too many or too few correct hits, and network security, but these problems are only temporary. In the near future any organization that wants to make information about itself available to the public will need a Web site, and these Web sites will become highly competitive advertising devices.\textsuperscript{12} As their sites on the Web demonstrate, most optometry schools and colleges have already discovered this.
Acknowledgments

We thank Jeb Weisman, Director University Information Services; Mike Geraci, Educational Technologies Specialist; and Scott W. Groth, Technical Consultant for their advice and assistance in this project. We also thank Les Walls, Dean of Pacific University College of Optometry; Dick Reinke, Associate Dean for Academic Programs; and Marilyn Dolby, Student Administrative Coordinator for their assistance. These acknowledgments do not necessarily imply acceptance of or agreement by the individuals acknowledged with any of the statements made in this paper.
References

BBS (Bulletin Board System): A computerized meeting and announcement system that allows people to carry on discussions, upload and download files.

Browser: A client program (software) that is used to look at various kinds of Internet resources.

E-mail (Electronic Mail): Messages, usually text, sent from one person to another via computer. E-mail can also be sent automatically to a large number of addresses (Mailing List).

FAQ (Frequently Asked Questions): FAQs are documents that list and answer the most common questions on a particular subject.

FTP (File Transfer Protocol): A very common method of moving files between two Internet sites. FTP is a special way to log in to another Internet site for the purposes of retrieving and/or sending files.

Gopher: A successful method of making menus of material available over the Internet. Gopher is a Client and Server style program which requires that the user have a Gopher Client program. Although Gophers spread rapidly across the globe in only a couple of years, they have been largely supplanted by Hypertext, also known as WWW (World Wide Web). There are still thousands of Gopher Servers on the Internet and it is expected they will remain for a while.

Home Page (or Home page): Several meanings. Originally, the Web page that a browser is set to use when it starts up. The more common meaning refers to the main Web page for a business, organization, person, or simply the main page out of a collection of Web pages,

Host: Any computer on a network that is a repository for services available to other computers on the network. It is quite common to have one host machine provide several services, such as WWW and USENET.

HTML (Hyper Text Markup Language): The coding language used to create Hypertext documents for use on the World Wide Web. HTML looks a lot like old-fashioned typesetting code, in which a block of text is surrounded with codes that indicate how it should appear. Additionally, in HTML it is possible to specify that a block of text,
or a word, is linked to another file on the Internet. HTML files are meant to be viewed using a World Wide Web Client Program, such as Netscape or Mosaic.

HTTP (Hyper Text Transport Protocol): The protocol for moving hypertext files across the Internet. This requires a HTTP client program on one end and an HTTP server program on the other end. HTTP is the most important protocol used on the World Wide Web (WWW).

Internet (Upper case I): The vast collection of inter-connected networks that all use the TCP/IP protocols and that evolved from the ARPANET of the late 60's and early 70's.

internet (Lower case i): Any time connect 2 or more networks are connected together, an internet results.

Intranet: A network of computers within a local area, such as a single company, that can communicate with each other and share information.

Java: Java is a new programming language invented by Sun Microsystems that is specifically designed for writing programs that can be safely downloaded to a computer through the Internet and can be immediately run without fear of viruses or other harm to your computer or files. Using small Java programs (called "Applets"), Web pages can include functions such as animation, calculators, and other fancy tricks.

Modem (MOdulator, DEModulator): A device that allows a computer to talk to other computers through the phone system.

Mosaic: The first WWW browser that was available for the Macintosh, Windows, and UNIX with the same interface. Mosaic really started the popularity of the Web.

Netscape: A WWW Browser and the name of a company. The Netscape browser was originally based on the Mosaic program developed at the National Center for Supercomputing Applications (NCSA). Netscape has grown rapidly and is widely recognized as the best and most popular Web browser.

Network: If 2 or more computers are connected together so that they can share resources, a computer network is formed. If 2 or more networks are connected together, an internet is formed.

Node: Any single computer connected to a network.
Search Engine: WWW site that helps to locate other sites devoted to a specific topic. Examples include Alta Vista, Lycos, and Yahoo.

Telnet: The command and program used to log in from one Internet site to another. The telnet command/program returns the log in prompt of another host.

UNIX: A computer operating system that runs on "underneath" other programs like word processors and spreadsheets. UNIX is the most common operating system for servers on the Internet.

URL (Uniform Resource Locator): The standard way to give the address of any resource on the Internet that is part of the World Wide Web.

WWW (World Wide Web): Two meanings. First, the whole constellation of resources that can be accessed using Gophers, FTP, HTTP, telnet, USENET, WAIS and some other tools. Second, the universe of hypertext servers (HTTP servers) which allow text, graphics, sound files, etc. to be mixed together.
Table 1. Number of host computers serving the Internet. Host computers are those that contain information that can be viewed or downloaded to a user's computer.\textsuperscript{9,10}

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>4</td>
</tr>
<tr>
<td>1984</td>
<td>1,024</td>
</tr>
<tr>
<td>1989</td>
<td>159,000</td>
</tr>
<tr>
<td>1992</td>
<td>1,136,000</td>
</tr>
<tr>
<td>1996</td>
<td>12,881,000</td>
</tr>
</tbody>
</table>
Table 2. Planning assumptions about target audiences and information needed.

<table>
<thead>
<tr>
<th>Target Audience</th>
<th>Information Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Students</td>
<td>Overview of the optometry program. Current catalog of courses. Introduction to the facilities and faculty. How to apply. Information on student activities in the area. Links to additional optometric and vision related sites. An Electronic Journal describing projects done at Pacific. News items about Pacific. An e-mail directory for faculty members.</td>
</tr>
<tr>
<td>Potential Patients</td>
<td>Clinical services provided. Location of clinics. How to make appointments. Sense that Pacific is a &quot;professional&quot; health care organization. General information on the eyes and vision. Links to additional optometric and vision related sites. An Electronic Journal describing projects done at Pacific. News items about Pacific.</td>
</tr>
</tbody>
</table>
Table 3. Costs associated with site development and maintenance.

<table>
<thead>
<tr>
<th>Development and Operation of Site for First 12 Months</th>
<th>Estimated Student/Staff Time and Cost for 12 Months</th>
<th>Estimated Facility Time and Cost for 12 Months</th>
<th>Estimated Total if All Personnel Costs Paid in Cash</th>
<th>Estimated Number of Visitors to Site</th>
<th>Estimated Cost per Visitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hours per month at $15 per hour for a total of $4,320</td>
<td>7 hours per month at $40 per hour for a total of $3,360</td>
<td>$7,680</td>
<td>4,500 visits counted including 500 visits made during site development. Total of 4,000 actual visitors</td>
<td>$1.92</td>
<td></td>
</tr>
<tr>
<td>12 hours per month at $15 per hour for a total of $2,160</td>
<td>5 hours per month at $40 per hour for a total of $2,400</td>
<td>$4,560</td>
<td>Estimated number of visitors ranges between 3,500 and 5,000</td>
<td>Range between $1.30 and $0.91</td>
<td></td>
</tr>
</tbody>
</table>
Figure Caption

Figure 1. Block diagram of Pacific University College of Optometry Web site components.
Pacific University College of Optometry

Academic Program
- Curriculum
  - Areas of Interest
    - Low Vision
    - Pediatrics
    - Practice Mgmt.
    - Vision Therapy
    - Academic Calendar
- Faculty
- Clinics
- Student Life
  - Weekend Guide
- Optometric Practice
  - Practice Opportunities
- Hot Topics & Special Events
- Alumni News

Contact Us

Ocular & Systemic Disease
- Contact Lens
- Baale Vision Exam
- Sports Vision
- Independent Study

Optometry
- Optometric Listings
- Area Weather
- Optometric Clubs & Organizations
- Jefferson Hall Renewal

Pacific Univ.
- Home Page
- Continuing Education

Figure 1.