Modernization of the Neilson Hays Library's Catalog

An Interactive Qualifying Project

Submitted to the Faculty

In Partial Fulfillment of the requirements for the degree of Bachelor of Science

WORCESTER POLYTECHNIC INSTITUTE

Date: March 1, 2000

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Abstract

In this project, we designed and produced an electronic cataloging system for the Neilson Hays Library in Bangkok, Thailand. This system introduced subject searching, and was designed to meet the unique needs of the library and the catalog users as revealed through analysis of interviews and patron observations. We also held training sessions to instruct the library staff on how to use the catalog so that they could update it effectively and assist patrons in searching the catalog.

Executive Summary

Almost completely hidden from the Bangkok streets by a screen of trees, the true beauty of the Neilson Hays Library only becomes apparent once past the front gate. The library's graceful dome and elegant pillars give weight to the title bestowed upon it by the Bangkok Post, "A Grand Palace on a Small Scale." Further credit is lent to the title by the interior of the library. Glass-doored cabinets full of books, and a quiet atmosphere give an impression of quiet solitude and history. A quick peek inside the library's rotunda gallery will reveal its most recent art exhibit. In searching the stacks you're likely to be approached by a Western woman inquiring to see if you need assistance; she's one of the Library Association members. That group of ladies has run the library since they were commissioned in 1869. There is also the pleasant possibility that you will encounter some acquaintance that you made at the last book fair who is now browsing the shelves or selecting some reading from the library's stock of donated periodicals. However, despite detailed scrutiny, there is one thing you will not see much of at the Neilson Hays Library, and that is technology. Library Association and patrons agree, modern technology has seemed to pass the library by. This is one thing the Library Association would like to change.

Currently, the library stocks about 20,000 books that can be searched only by a traditional card catalog. This catalog allows the collection to be searched by author and title only. At a time when city libraries have electronic catalogs that allow subject searching and commonly share collection information over the Internet, the Neilson Hays Library is equipped only with a slow and outdated computer that is utilized solely for keeping track of membership information.

Over the last few decades, a conflict has appeared between incorporating modern library technology and preserving the library's rich historical atmosphere. The library is a private organization that sustains itself on membership fees. Since the patronage pays for their membership, they do not hesitate to let the governing body of the library know what changes they oppose. This governing body, called the Library Association, is attempting to enhance the library's technological status. When suggesting changes for the library, the Library Association must work with the patrons so that the historical atmosphere of the library is not disturbed.

The goal of our project was to assist the library in improving their patron services by adding an electronic catalog that incorporates subject searching. Since the patrons and staff are not entirely comfortable with the technology behind electronic cataloging, it is important that the catalog be simple enough to explain in a brief training session. Another important aspect that we had to consider when implementing the catalog was the previously described conflict between technological advance and the historical atmosphere of the library. Furthermore, the electronic catalog needed to meet the expectations of the patrons and staff in order to be comfortably utilized upon installation. To accomplish our goal, we employed a three-step methodology which consisted of gathering information about the desired functionality of the catalog, analyzing this gathered information to develop criteria for the cataloging system, and designing and coding the final electronic catalog.

First, we needed to determine the cataloging methods currently employed, the technical abilities of the groups that would use the catalog along with their preferences, desired long-term functionality of the catalog, and the library's ability to facilitate

different system types. Upon arrival at the library, we identified the three groups that could provide us with this important information as the Library Association or Board of Directors, the library staff, and the patrons. By examining the nature of the information we wanted to obtain from each group, and exploring social science methods for gathering these types of information, we chose interviews and patron observations as our methods for on-site information gathering.

Six criteria evolved as a result of our data analysis phase. These criteria were developed from themes and ideas presented in our interviews and field notes. Each criterion based upon theme(s) was designated an essential criteria. The three essential criteria were: The ability to search by subject, Internet availability, and "user friendliness." A subordinate set of criteria was developed based upon ideas as opposed to themes: Accommodation of both leisure and research readers, simplification of the staff jobs, and detailed book information.

In the third step the criteria developed through data analysis were used to govern the features of the electronic cataloging system. The criterion that resulted in the largest visible effect was that of the system being Internet ready. Since the most common method of searching on the Internet is through the use of a web browser, we decided that the catalog would be in the form of a web page that would only be available on the local computer until it is placed on the Internet. The nature of web browsers also allows for the customization necessary to incorporate different options and to interact with the database program to be used, Microsoft Access. The database was instrumental in the development of the subject index, as the catalog had to be able to contain and search the subject fields of each book. The system also had to be easy to use. There were a few

different ideas of what made a system user-friendly. We found that most patrons had prior exposure to the Internet and could provide us with insight as to what they found easy to use in this arena.

Despite time constraints we entered over 100 books into the system to demonstrate the catalog's searching capabilities. We found that this demonstration not only showed proper catalog functionality, but also trained the observer in operation of the search functions. For this reason, the training sessions employed consisted of the search demonstration, a demonstration of entering books and editing those entries, a trainee-conducted search, entering a book, editing any entry, and a question and answer period. This training session allowed the trainee to gain a full grasp of the system's capabilities and any functions that may be desirable in their system usage.

By sponsoring our project, the Neilson Hays Library has continued along the journey of incorporating technology to better serve its clientele. While our project has supplemented the card catalog with an electronic format with a subject index, there are more advances that could be incorporated. To make the collection more accessible the library can make the catalog available over the Internet through their web page. While the Library Association plans to put the catalog on the Internet in the future, they perceive this step as difficult and therefore have the potential to postpone this improvement longer than necessary. For this reason, we recommend that they consult their web-site host now to get an accurate idea of what expenditures would actually need to be made for this improvement to be facilitated. Once on the Internet, the library can subscribe to electronic catalogs, link itself to searching databases and possibly link to other libraries. The Internet availability of this system would provide patrons and other

potential catalog users with another, better way to locate desired reading materials in the greater Bangkok area and beyond.

Acknowledgements

We would like to express the utmost gratitude to Library Association of the Neilson Hays Library for their encouragement, especially Barbara Greenland for fostering the WPI-NHL connection, Sara Sandberg, Jenny Jones, and Nancy Wehlau for their encouragement and guidance. We would also like to thank our advisors Chyrsanthe Demetry and Steve Pierson for their continuous encouragement of our best effort. Finally, we extend our thanks to Wes Jamison and Sumalee for providing us with a strong foundation for success in Bangkok.

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Authorship

This report was the product of a cooperative writing effort of all team members. Some sections were written by individuals and edited by the group, while other sections were written by team collaboration. The following list identifies the primary author where applicable.

1. Introduction

Almost completely hidden from the Bangkok streets by a screen of trees, the true beauty of the Neilson Hays Library only becomes apparent once past the front gate. The library's graceful dome and elegant pillars give weight to the title bestowed upon it by the Bangkok Post, "A Grand Palace on a Small Scale." Further credit is lent to the title by the interior of the library. Glass-doored cabinets full of books, and a quiet atmosphere give an impression of quiet solitude and history. A quick peek inside the library's rotunda gallery will reveal its most recent art exhibit. In searching the stacks you're likely to be approached by a Western woman inquiring to see if you need assistance; she's one of the Library Association members. That group of ladies has run the library since they were commissioned in 1869. There is also the pleasant possibility that you will encounter some acquaintance that you made at the last book fair who is now browsing the shelves or selecting some reading from the library's stock of donated periodicals. However, despite detailed scrutiny, there is one thing you will not see much of at the Neilson Hays Library, and that is technology. Library Association and patrons agree, modern technology has seemed to pass the library by. This is one thing the Library Association would like to change.

The Neilson Hays Library is in the process of incorporating modern library technology. The idea behind the process is that while the library's rich historical background and atmosphere allow patrons to overlook and even appreciate technological inadequacies, the further lack of incorporation threatens to render the library's services obsolete and changing its role to that of a museum. In order to maintain its role as a

living library, the Neilson Hays Library would like to modernize its patron services. Currently, the library uses a traditional card catalog that can be searched only by author and title. The library is looking into updating its catalog in such a way that it would be easier to use and more accessible. There are three possible improvements that are being considered.

First, the Neilson Hays Library would like to improve its current catalog by introducing a subject index. This addition is being considered because it would allow patrons to search the catalog without knowing the work's author or title, and would strengthen the library's ability to be used as a research facility. The exact subject matter of a given work is an abstract concept, unlike the author and title, and is therefore open to interpretation. This open interpretation means that subject indices could be difficult to implement in a card catalog format because each book could be listed under many different subjects. The hassle of creating and organizing multiple cards for each book could be avoided by implementing an electronic catalog.

Electronic cataloging is the second major improvement that the library is considering, due to its many advantages over traditional card catalogs. With an electronic catalog, librarians would not have to spend time alphabetizing cards or typing up multiple subject cards for the same book. Electronic catalogs provide a less difficult method for using multiple subject headings, since all of the book's subject information can be included in one entry. Patrons will benefit from this improvement as well, since the need for flipping through cards alphabetically will be eliminated, thereby saving time. Another important benefit to installing an electronic system is that it can be made available outside the library over the Internet.

The third improvement that the library is considering is making the electronic catalog accessible over the World Wide Web. This modification could eliminate the inconvenience of traveling to the library, in congested Bangkok traffic, to determine if a book is in the library's collection. This improvement is a long-term goal, and is beyond the scope of our project. However, it is important that an electronic catalog is designed such that it can be easily modified to allow web access in the future.

While these improvements are technological in nature, their successful implementation depends upon certain social aspects. The library is a non-profit organization with a limited budget. As such any system designed has to be economically feasible such that its implementation would not be a detriment to the library's other services. The library is in place to serve the needs of a community, which has a large say in what services the library implements. For this reason, the acceptance of the system by the patrons is important, because they are the foundation of the library's existence. In order to gain their acceptance, the system should be tailored to meet their searching needs.

The goal of this project is to design and demonstrate the feasibility of a system by which the Neilson Hays Library can implement an electronic catalog with a subject index. The system will be designed such that the library's staff can learn to use the catalog with only basic computer knowledge supplemented by a brief training session and the patrons can use the system to gain electronic access to the collection. Our system will be tailored to the needs of the Neilson Hays Library, its patrons and employees. This goal will be accomplished by interviewing patrons, Library Association members and staff to determine the criteria for system selection, using these criteria to design an

appropriate cataloging system, partially implementing the electronic catalog and teaching the staff how to use and maintain the catalog in order to ensure its future success.

2. Literature Review

While all libraries face cataloging challenges, none face the same cataloging problem as the Neilson Hays Library as we explained in Chapter 1. In order to create a catalog that would be the most useful to the library, it is important that we understand what factors led up to the library's current situation. Researching the history of this library provides insight into the unique problem that exists and some criteria to be met by any proposed solution. Examination of current library organization techniques and existing cataloging systems gives a framework for possible courses of action. By looking at different transition methods and comparing them in light of this library's situation, a method can by synthesized for the successful changeover of the Neilson Hays Library's catalog to an electronic format. Procedures for training of library staff and patrons are also important to research because after the system is implemented, they must learn how to use and maintain the new catalog.

2.1 The Neilson Hays Library

The unique nature of the Neilson Hays Library adds multiple dimensions to the problem of providing an appropriate catalog. The library is interested in an electronic catalog with a subject index to supplement its current card catalog. In looking at the library's situation it becomes apparent that the technical aspects of creating this supplement are by no means the only aspects to be considered in the completion of this project. The library's needs will be defined by describing the library's history,

examining its current cataloging system, establishing the patrons' concerns, and evaluating the financial and technical status of the library.

The Neilson Hays Library has reached its current status with the continual guidance of its governing body, which is called the Library Association. The Library Association was founded by a group of lady missionaries in 1869. The primary goal for these women was to provide a collection of English language books for the expatriate community in Bangkok (Farrelly). At the time of the library's founding, foreigners were not allowed to own land in Thailand, so the collection was housed in the space that was donated to them or rented out for a small cost. Eventually, the Library Association needed to construct a permanent building for their collection, and in 1914 they were given special permission to own land in Bangkok. In 1920, Dr. T. Heyward Hays provided an endowment to the Library for the construction of the current building in memory of his wife Jennie Neilson Hayes, a founding member of the Library Association. Today, the library continues to be guided by its original goal of providing English language works to Bangkok expatriates, and boasts the title of a historic landmark serving the community.

In addition to providing reading materials to the English readers in Bangkok, the Library Association has incorporated cultural activities to better meet the needs of the patrons. The Library Association arranges art exhibits in the library's rotunda, invites authors to discuss their works with the patrons, and has story time for the younger patrons (*http://www.neilsonhayslibrary.com*). By adapting to facilitate patron suggestions in this way, the library also acts as a venue or cultural center for the English speaking community.

The patrons of the Neilson Hays Library have a significant voice as to what changes are made by the Library Association. Since their membership fees make up a large part of the library's funding, they have the right to voice their opinion about how the money should be used. Many of the patrons are very fond of the historical atmosphere of the library, and have a tendency to show opposition to changes that may adversely affect this atmosphere. When air conditioning was proposed to help preserve the collection, some patrons were vehemently opposed because its ability to blend into the aesthetics of the building was in doubt. For this reason, the addition was only made after careful design as to leave the building's aesthetics undisturbed (Wehlau). This situation is a good example of how patrons influence decisions made by the Library Association.

The patrons and Library Association members have expressed some concerns about the current cataloging situation at the library. The library catalogs its 20,000-volume collection, excluding the paperbacks, using four separate card catalogs: Adult fiction, Adult nonfiction, children's fiction, and children's nonfiction. The fiction sections are arranged by Cutter Numbers where each author is assigned a predetermined number based on their surname while the nonfiction sections are arranged using the Dewey Decimal System where each subject is assigned a number and the subjects are grouped by discipline. All of the catalogs can be searched by both author and title, but patrons who are looking for a book on a particular subject are limited to either browsing the shelves or asking the librarian for assistance. The library currently has limited computer technology. The library has one computer that runs Microsoft Access, which is used for keeping the member list and printing flyers and labels. Their computer is

outdated and would not be sufficient for storing and running a suitable electronic catalog. The library has a small income, which is what has prevented them from updating the system in the past. However, they have recently acquired a computer that would be capable of supporting an electronic catalog.

These unique attributes require special consideration when designing an electronic cataloging system. While the Library Association wishes to incorporate technology to improve library services, they also wish to preserve the building's historical significance and atmosphere. The library's patrons are also attached to the historical pleasantries of the building, and therefore may show disapproval of the installation of a new computer. These factors considered, one can imagine the care that must be taken when designing a system that involves inserting modern technology into this setting. Regardless of *how* the catalog is incorporated into the atmosphere the library, the system will have to apply ideas from library science and modern cataloging techniques.

2.2 Library Science and Cataloging

Library science can be defined as the study of organizing and cataloging library materials. Efficient cataloging became necessary as the number of resource materials in the libraries began to increase. As a result of the evolution of library science, some standard guidelines for organizing library materials have been created in an effort to make the library material classification process as simple as possible. Technological advances, particularly computers and the Internet, have had a profound impact on library

science. The impact of technology on library organization and cataloging shows us that the library science evolution process is an ongoing endeavor, and is still subject to change.

2.2.1 History of Library Science and Cataloging

Although forms of cataloging have existed for over 4000 years, library science has really only developed over the last several hundred years or so. The cataloging standards that evolved from library science were produced through the collaboration of many different librarians, even though some ideas were initially suggested by only one person or few people. Regardless of who initiated the guidelines, they were still subject to constant revision by countless librarians. Even today, formats that have been in use for years are still revised constantly through conferences and meetings of large numbers of library scientists.

Ever since information has been available in written form, there has been a need for organizing it so that specific information could be filtered out from larger quantities. Early forms of cataloging date as far back as 2000 B.C. in the form of clay tablets, which were used by the Sumerians to organize various writings. At this time, the catalogs were relatively small and straightforward, so not much thought was given to determining how to set up the catalog (Dunkin, 1).

With the advent of the printing press, written information could be produced at an astounding rate in the form of books. The result was an increase in the need for cataloging due to the great amount of information that was being circulated and collected.

Catalogs themselves eventually had to take on the form of large printed books due to the large size of text collections. These early catalogs were generally organized in a simple fashion, alphabetically by author or title. They were designed for searchers who had a specific book in mind (Dunkin, 2).

As libraries began to grow in size and become commonly used by the general public, it became apparent that users did not always enter the library in search of a particular author or title, but rather in search of a particular topic. Naturally, the concept of organizing books by their subject matter was developed. Using subject organization, library users could find information without knowing a single author or book that dealt with the topic they desired to research. The task of organizing books by subject is more complex that the author-title approach. The author and title of a book is a concrete idea, whereas the exact subject matter of a text is often open to interpretation. How specific should the topics be? How should they be worded? Should the topics only be single words, or phrases? If we use phrases, which word comes first? How should the catalogs be organized? How should the books be shelved? Different librarians answered these questions according to their own ideas, resulting in organizational methods that were usually incompatible with other libraries' systems (Drabenstott).

The first standardized method for physical organization of books by subject came about in the form of the Library of Congress (LC) classification system. The LC system was developed gradually over the course of about one hundred years. This system was not initially intended for use with any sort of formal catalog, but was rather designed to determine how the books would be physically ordered on the shelf. Originally, in 1802, the Library of Congress was organized by the physical size of the texts. In 1814, a

classification system, which had been used by the Benjamin Franklin Library Company, was introduced to the Library of Congress. This new system divided the materials by grouping them into one of 18 subjects, such as sacred history, geography, law, logic and so forth. Two years later, Thomas Jefferson introduced a more detailed 44 subject system. The subject categories became more and more numerous until the official Library of Congress Subject Headings were decided upon in 1900. As the subjects got more detailed, they began to assign numbers to each subject. By using a multiple digit number, librarians discovered that they could create very accurate subdivisions of general topics. The design was initially intended for use only in the Library of Congress, but other libraries quickly caught on to the organizational scheme and it became one of the most widely accepted subject organization methods (Immroth, 11).

During the development of the LC system, a standardized set of cataloging rules was published in the form of a book written by Charles A. Cutter. In 1876, Cutter released the first printing of his book entitled Rules for a Printed Dictionary Catalog. In his work, Cutter describes three main objectives for a library catalog. First, the catalog user should be able to locate a book by knowing its author, title, or subject matter. Second, the catalog should allow the user to easily find all of the books in the library that have the same author, subject matter, or literary style. The third and final objective is that the catalog should be able to assist the user in the selection of a book based on its edition, subject matter, or literary style. Cutter's work is regarded as one of starting points for the development of library science (Jonker).

The concept of a card catalog was the next significant event in the evolution of library science. Cutter's rules were intended to be implemented as a printed dictionary-

type book, which was a permanent and unchanging resource. Libraries began to obtain materials at a faster rate, which meant that the catalog had to be updated regularly. This was not feasible for bound catalogs, because they would have to be constantly reprinted. As a result, the concept of card catalogs became popular at the start of the 20th century. With a card catalog, references could be added as soon as they became available in the library, so the catalog was always up-to-date. Card catalogs quickly became a widely accepted standard. Following the trend of standardization, more advanced methods of catalog organization began to appear and gain wide acceptance (Vickery, 12).

The next major advance in library science was the development of the *Paris Principles*. They were produced as the result of an international conference on cataloging techniques in Paris in 1961; the *Paris Principles* provided a set of guidelines for library information organization that were geared towards the idea of a card catalog. The principles set forth rules not only for the way the cards should be organized, but also for the way each card should be formatted. These principles eventually led to the development of the Anglo-American Cataloging Rules (AACR), which are one of the cataloging formats that are commonly used in today's card catalogs.

2.2.2 Modern Library Science and Cataloging

The main principles of library science have endured through many cataloging revisions, and are evident in the organizational and cataloging formats of today. The first fundamental concept is the idea of allowing the catalog user to find a book by knowing only its author, title, or subject matter. The second principle for cataloging is to ensure

that the user can easily locate all that the library has on a given subject, or by a given author. These principles are covered by the AACR, or Anglo-American Cataloging Rules, Library of Congress Classification, and Dewey Decimal Classification, which are in common use today.

The Anglo-American Cataloging Rules, which first appeared in 1967, provide rules for determining what constitutes a subject heading. First, the AACR specify the location where bibliographic information is to be obtained for different types of media. The bibliographic information for books, for example, would be found on the title page and the opposite side of the title page. Some other materials that have standardized directions for obtaining the catalog information are sound and video recordings, manuscripts, artifacts, and microforms (Chan, 29). From the information found in following these directions, the cataloger must decide what is to be the main entry point for the catalog. The main entry point could be the author, editor, title, illustrator, or any sort of person or organization that is described in the work.. Once the main entry point is selected, the materials are given a catalog entry under this attribute, which becomes the main entry. All of the other aspects of the material that were not chosen for the main entry point are used for creating additional entries. The added entries refer the user to the main entry, which contains detailed information about the text allowing for easy location in the library (Chan, 85). These entries are what AACR considers to be suitable searching aides for those who do not know a specific author or title relating to the information they hope to locate.

The AACR format has gone through some changes over the years, including splitting into British and American versions and the development of AACR2 in 1978.

AACR2 came about as a result of years of slight changes that libraries had made to the original AACR. AACR2 also took technology into account, realizing that formats could be adapted to suit the needs of an electronic catalog (Maxwell, 5). The AACR system is revised so often that there exists a committee known as the Joint Steering Committee for Revision of AACR that focuses on revisions that meet different technological and social needs (http://www.nlc-bnc.ca/jsc).

The Library of Congress system for subject headings is another set of guidelines that has essentially become standard among most libraries. The LC system is based around the concept of uniform headings. The goal of uniform headings is to ensure that if catalog users are to look under a particular subject heading, they will receive a list of any and all materials pertaining to the heading. This way, if users could not locate an appropriate resource under a given topic, they could be assured that they won't be able to find it anywhere else in the catalog. This method lets users know whether or not a certain item is available (Chan (LCSH), 24).

The current Library of Congress system uses alphabetic letters to code its main subject headings, and then further specifies the topics with numerically coded subdivisions. The system is very thorough and detailed. A complete listing of all possible specific subject headings is roughly 7,000 pages long (Schimmelpfeng). If only the broadest LC subject areas are considered, there are 29 main classes. These main classes are coded using one or two capital letters. Some examples of these codes are A for general works, M for music and books on music, Q for science, KF for United States Law, and Z for Bibliography and Library Sciences (Immroth, 32). Most of the books listed in the bibliography of this paper are classified under the Z subject heading. The

second letter in two-letter subjects specifies a more particular type of the broad first letter subject. For example, K is the class for law and KF represents United States law in particular (Immroth, 222). Other letters after K stand for laws of different types and different locations. Some subject headings are coded with up to three letters for their code. KFN, for example, represents Law of states of the United States that begin with the letter "N" (Immroth, 226). Once a subject is coded with three letters, it is no longer considered one of the main 29 subjects. The Library of Congress system provides for even further detail by using integral numbers. These numbers follow the letters representing main topic and specify a very particular aspect of the topic. The integral numbers can divide the heading into so many subcategories that these numbers occasionally reach values of over 6000 (Immroth, 261). The general rule for the integral numbers is to order the subcategories in a logical fashion. For example, under the main category of history, the integral numbers go chronologically, with the lower numbers representing earlier time periods and the higher numbers representing more recent times (Immroth, 39).

The Library of Congress system has a smaller counterpart known as the Dewey Decimal System. The concept is essentially the same as the LC system. Books are organized into numbered divisions, which represent different preset subject matter. The main difference between the LC system and the Dewey Decimal System is that the Dewey system has a much smaller level of complexity. As a general rule, libraries with under 20,000 volumes would be likely to use the Dewey Decimal System, while larger collections would use the more intricate and tedious LC system. For this reason, smaller libraries such as public school libraries generally use the Dewey System (Liukaa, 15).

Many of today's books have already been placed under an appropriate subject heading, and come with a Dewey Decimal number and Library of Congress number printed on the opposite side of the title page. The printing of cataloging information in the text itself is called the Cataloging in Publication data (Manheimer). If the book does not come with such information, it is the librarian's job to determine the appropriate classification number by browsing the text or reading an abstract or introduction (Sandberg).

As mentioned previously, much of the reason why organizational formats have been subject to revision is because of the advent of the computer age. Electronic cataloging has had a huge impact on the way catalogs are organized and used. Some traditional organizational and cataloging formats have been revised in order to accommodate easy implementation by computer code. Storing and searching the library catalog on a computer system can greatly increase the speed and efficiency with which texts are found in the library. Electronic catalog searching could be streamlined if catalogs were standardized to meet the needs of computers.

2.3 Electronic Catalog Systems

The technology behind the electronic cataloging systems has made great improvements in the relatively short time that it has been popular among libraries. When they first began to appear, catalog systems would often store the catalog database by the means of bulky reel-to-reel tape machines, which were interfaced through terminals placed throughout the library. These machines were expensive, slow, and very difficult

to operate. Now, libraries can implement these catalogs with much smaller, faster, and cheaper equipment such as computer hard drives. In addition, the arrival of the Internet has provided many new options in terms of how electronic catalogs can be accessed. The older systems only provided accessibility from within the library. Now, many library catalogs can be accessed worldwide over the web. While the technology behind the electronic catalog has changed dramatically, there have always been three main elements to the catalog: the hardware or storage mechanism, the software, which provides for operation, and the interfaces that are used to search and maintain the catalog.

2.3.1 Storage Options

An important aspect of any electronic cataloging system is the physical location of the mechanism that stores the catalog's information. Since computerized databases can be accessed and updated remotely via the internet, the actual device that holds the catalog entries, which is usually a computer hard drive, could be located anywhere, provided that it is connected to the Internet. This means that the catalog can be stored on-site at the library, or stored off location by some sort of information hosting company or other agency; each option has certain advantages and disadvantages.

An on-site hosting system has characteristics that could be considered positive or negative depending on the library concerned. One disadvantage to on-site hosting is that the library would be required to purchase a computer that is capable of quickly returning search results to many users at once. A computer such as this could cost anywhere between several hundred to a thousand dollars, depending on how frequently patrons are

predicted to search the catalog (Price Watch). Also, if the library decided to make its catalog available over the web, the library would have to install some sort of permanent internet connection, which would be an additional $40-$70 a month depending on the speed of the connection. On-site hosting would also require that the library be properly staffed with those capable of running and repairing the server, if need be. In *The In-House Option*, T.D. Webb states that in general, librarians lack the expertise required to operate some of the more advanced cataloging systems (Webb, 33). This could lead to either extensive training for the library staff or the hiring of additional staff with the necessary experience. In an extreme case, an entire new staff department had to be created for the University of California Library in Chico, California when they decided to create on-site electronic catalog (Post, *vii*). The main advantage to hosting on-site is the fact that the catalog is always easily accessible for maintenance and updating. Hosting on-site allows complete control over the way the database is managed and accessed, and can therefore be customized to the needs of the library.

Off-site hosting has its own inherent traits that can prove it to be a desirable or undesirable option for a library to implement. First, with this system accessibility and customization are limited. The catalog is stored by an external hosting company, which would have jurisdiction over exactly what software and hardware were being used. The people who would actually be running the computer would be computer specialists and not librarians. This could cause the system operators to be more concerned with the technical efficiency of the system as opposed to the organizational efficiency (Webb). While technical efficiency is important, the arrangement of the catalog and its interface is something that is of great concern to librarians, and remote system operators may

overlook these factors. On the other hand, remote hosting does not require a permanent high-speed Internet connection. If hosted remotely, the library would only need to access the catalog occasionally for searching and updating. Occasional access could be provided by a relatively inexpensive, low-speed, dial-up Internet connection, as opposed to the pricey, high-speed connection required for hosting the catalog themselves. Remote hosting would also relieve the staff of the library from the technical duties involved with running an information server. Essentially, remote hosting would clearly divide the roles between the technical and organizational aspects of the catalog. This would be beneficial in that it is difficult to train one person in both fields, but it could also be costly in that the two separate groups must be able to cooperate and reach compromises if differences arise (Webb, 37).

2.3.2 Software Implementation

There are a large number of existing software applications and programming techniques that deal with database information retrieval. These applications break down into two main groups: server-side software and client-side software. In a system that has multiple computers which access the database, client-side software tends to be the most troublesome since it needs to function properly on all of the different types of computers that may access the catalog (Post). The World Wide Web has presented itself as a solution to this problem since any computer that has a web browser installed understands web pages.

The server-side software is what stores and manages the catalog database. The librarians who update the catalog need to be familiar with this software. A good software package for this application allows the librarian to easily maintain the catalog without having to worry about the intricate details of computer coding. The idea is to separate the librarian from the technology, so that the librarian does not have to know any extraneous technical information (Lefkovitz, 2).

Client-side software refers to the program that patrons use to search the catalog. This software performs the same role as the server-side software in that it has to make the details of computer searching transparent to the user, allowing the patron to access the catalog with minimal technological experience. If the catalog database is made available to outside users via the Internet, client software can create some complications. Since many different people are using the software on different systems, it has to be made available on all platforms. In addition, the software must be kept up-to-date. If, for example, a bug is found in the current software and a newer version is created as a fix, the update has to be distributed to all of the users (Sundsted). Also important is that the catalog be as accessible as possible. If a potential user cannot search the catalog because they do not have a particular piece of software or the correct version of the software, the accessibility of the catalog dwindles.

In light of the hassles that arise from using specific client-side software for Internet access, catalogs and other databases have begun to take advantage of the web. By making the catalog available as a web page, it becomes accessible through a web browser, which is standard software on most of today's computers. It doesn't matter what type of web browser is used, what operating system is used, or where you are in the

world. Web access therefore greatly enhances the patrons' ability to access the catalog easily.

In order to incorporate a web interface for electronic cataloging systems, programmers have developed a method by which web pages and databases can communicate called Open Database Connectivity, or ODBC. ODBC is a set of function calls that are understood by most popular database programs, including Microsoft Access. These function calls allow an application to connect to a database and retrieve or send information (Colburn). One such example of how an actual ODBC function call looks in a piece of code is:

odbc_connect (NHLCatalog, NHL, library)

This call would log into the database called NHLCatalog, with user name "NHL" and password "library." Once information has been obtained by the application, it can be formatted and displayed however the programmer dictates (Aulbach).

ODBC calls are not directly compatible with Hyper-text Markup Language (HTML), which is the language that is used to create web pages, but programmers have developed a solution to this problem called Common Gateway Interface (CGI). HTML is a simple language that deals primarily with the layout of text and graphics on a web page. Despite its lack of ODBC functionality, HTML can be used to activate other pieces of code called CGI applications, located outside of the HTML code itself. With CGI, web pages can call other programs to process information, and the programs can in turn send information back in HTML format so that it can be displayed as a web page. (Colburn)

The Personal Hyper-text Preprocessor programming language, or PHP, was designed exclusively for use as a CGI application, and contains built-in ODBC functions

that can send and receive information to and from a database. PHP allows programmers to place lines of code in the same file as the HTML code, so long as the two are clearly separated by certain predefined markers (Aulbach).

2.3.3 User Interface

A user interface is the interactive display that the user navigates when dealing with a computer. In the case of an electronic catalog, these are the controls that the user interacts with when conducting a search. In order for a catalog to be of any assistance, the interface must be easily understandable by all potential users.

The potential users are divided into two groups: the library patrons and the library staff. One group searches the catalog and the other enters books into the catalog, thus two different interfaces are required. The interface that patrons use to search the catalog is called the client-side interface, and the interface that the staff uses to enter texts into the catalog is called the server-side interface. To accommodate users that have difficulty navigating the catalog, most libraries tend to provide extra instruction, as opposed to redesigning the interface. This method of added instruction has been proven to be an effective means of simplifying catalog use (Nahl).

Ease of use is the main objective in designing both types of user interfaces. Comprehension of the interface is very important to everyone, from first-time users to reference librarians. All users need to be able to navigate the interface if they want to use the electronic catalog. In a survey of 57 university librarians and system managers, A. Hossein Farajpahlou, University Librarian at Shahid Chamran University, found that

almost all surveyed librarians wanted the new system interface to be easy to use, and all wanted to incorporate "user-friendliness" (176). However, one of the case studies from the *Online Catalog: The Inside Story*, a collection of case studies based in Chico, CA, states that no matter how easy and user friendly they made their interface, there were always steps that would confuse some people (84-85). Diane Nahl, Associate Professor in the University of Hawaii Information and Computer Science Department, agrees with *Online Catalog*, pointing out that while the goal of the user interface might be aimed at easy comprehension, studies show that even after taking several training sessions novice catalog users still ask several questions about how to search the catalog (281).

Simple solutions to alleviating user confusion are often the best, and almost always underestimated. Making the catalog's user interface more understandable was found to be as simple as putting printed (paper) instructions at each terminal. This solution cut down on patron questions immensely (*Online Catalog*, 84-85). Nahl backs up this method saying, "Written instructions helped one in three [of the surveyed students], but they are undervalued by the majority of the end-users," (Nahl, 282-283). While many problems are attributed to the user interface, not many solutions are offered that deal with the user interface itself. Instead, paper handouts, and other non-electronic remedies are often shown as viable solutions.

With the electronic catalog options that have been presented here, one must appreciate the amount of planning that has to go into changing from a traditional card catalog to an electronic catalog. Librarians must consider issues of cost, training, staff, time, and others in order to make the conversion. The transition is not always easy, but many libraries have gone through it and more are following the trend.

2.4 Transition Methods

The transition period over which the catalog takes on its new form needs to be defined, as it affects both staff and patrons' ability to adjust. The shorter the period of change, the more drastic the adjustment the staff and patrons have to make. Staff and patron training are often necessary in order to help acclimate them to the new catalog.

2.4.1 Catalog User Training

When moving to a new, more complicated cataloging system, it is often helpful and sometimes necessary for the catalog users to be trained in proper operation of the catalog. This means that both the staff and patrons might have to be trained. Patrons are more likely to be comfortable learning catalog use from the librarians rather than from the creators of the catalog, so catalog installers often teach the librarians how to utilize the searching capabilities of the catalog, in addition to learning how to enter books into the catalog. By learning how to search as well as enter books, the librarians can assist the patrons in using the catalog.

Under the best situation, an electronic catalog would be entirely self-explanatory, so that users would not have to be trained in its usage. . The actual situation, however, is never ideal. According to A. Hossein Farajpahlou, University Librarian at Shahid Chamran University, surveyed librarians thought that users should not have to take orientation courses; instead the user interface should fulfill the need for the self-

instruction of the users (176). Farajpahlou's survey also indicated that less total training for both staff and patrons should be a criterion for the success of an automated cataloging system (174). However, this idea contradicts previously cited information from *Online Catalog*, in that most libraries could not completely eliminate the need for training. However, Diane Nahl, Associate Professor in the University of Hawaii Information and Computer Science Department, explains that despite well-designed course-integrated instruction, demonstrations, hands-on practice exercises, workshops, printed handouts and even Web sites with detailed instructions, first-time users still needed help during their own searches (Atlas et al, 68); (Nahl, 281). What this means is that while ideally users should not need training, the reality is that most will need some kind of help in understanding the new system, regardless of whether or not formal training is available.

Librarians are the most obvious source of help in a library, and as such are going to need the most intensive training (*Post* 83); (*Using Online Catalogs* 106). *Using Online Catalogs: A Nationwide Survey*, a survey of 8094 users and 3981 non-users of online catalogs conducted in 1983 by The Council on Library Resources, found that 90% of all first-time users asked for some kind of help, and 51% of them asked the library staff when conducting their first session with a catalog (105-106). This points to the idea that librarians will be asked about the new system fairly often and should therefore be as comfortable as possible with the new system.

Most patrons liked the option of holding training sessions to learn to use new catalog, but given the option, did not actually spend the time to attend. *Using Online Catalogs* found that most people who are not currently using an online catalog at their library think that instructional sessions on how to use the online catalog would be very

helpful. Over 80% believed that training would take less than 30 minutes to complete. However, out of this same group of people most indicated that they don't have the time for it, and/or don't think that they would go (95-100). Users felt that, while training sessions would be helpful, they just did not have the desire or time for them.

Most librarians already deal with patrons seeking help, so they are in a good position to instruct the patrons in the use of the catalog as needed. A large number of patrons seek assistance from the librarian rather than spend time attending sessions on how to use a new system (*Using Online Catalogs* 95-100). This situation calls for the librarians to understand how to utilize the new system to the point where they can instruct the patrons in its basic use. They should know how to explain most, if not all, of the system's functions. The more comfortable they are with the system, the easier it will be for them to help the patrons.

2.4.2 Timeframe for Transition to an Electronic Catalog System

The style of the library as well as its clientele must be considered when choosing the adjustment period necessary to make the transition from hard copy catalogs to online catalogs (Using Online Catalogs). Conservative libraries tend to be hesitant of the electronic transition regardless of its being Internet available (Drabenstott). More liberal libraries, generally educational institutions with high interest in the most current and efficient system, have been known to install electronic catalogs as quickly as possible (Using Online Catalogs).

The cold turkey approach describes the most commonly cited method of going online. Using this instantaneous approach, the catalog is not made available until all of the books in the library have been entered (Drabenstott). During installation of the system, users remain limited to the card catalog. When installation is complete, the catalog is made available, at which time the users have instant access to the entire catalog and can search from any Internet ready location.

For a slower, more conservative method, a library can go through the electronic catalog as an intermediate. Using this method of in-house hosting, the users are able to become familiar with electronic searching prior to Internet availability. When the catalog finally becomes available over the Internet, the patrons already will be experienced with the catalog's use. Since the patrons will be comfortable with the catalog, they will more readily take advantage of the system's web accessibility.

3. Methodology

There were three main phases that we completed in order to accomplish our goal of designing an electronic catalog and training program. In the first phase we collected information describing the current catalog usage, desired catalog functionality, and users' levels of experience with technology. Phase two consisted of analyzing this information in order to determine catalog and training program design criteria. During the final phase these criteria were applied to the design process to create the catalog's interface and the associated training program.

3.1 Collect information needed for design process

In order to design an electronic catalog that met the needs of the Neilson Hays Library's users, information had to be obtained from potential catalog users about their usage of the current system, preferences they would like to see incorporated in an electronic system and their ability to navigate such a system. There were three groups of catalog users: the Library Association, the library's staff and its patrons. Each group possessed information that pertained to catalog design, training design or both. By first understanding exactly what information we needed to obtain from each group and our justification, we were able to choose the best collection methods available using social science principles.

Initially, an observation period was conducted to get acquainted with the library as well as the different user groups and their interaction with the library. Normally, the presence of the researcher has the potential to alter the behavior of those being observed.

However, in the case of the Neilson Hays Library, we were perceived as fellow patrons, and so could observe without affecting their normal habits. The observations were recorded allowing for their potential use to support information gained directly from the user groups, justify any proposed sampling methods, and most importantly maintain a record of what information was obtained during this time period. We observed the patrons, noting their first destination in the library, searching behavior, catalog use, interaction with the staff or Library Association members, approximate age, sex, and cultural group in an Excel spreadsheet.

Library Association

As the initiators of our project, the Library Association could explain the underlying motivation for our project as well as long-term goals for the library, which in turn would allow us to design a system in accordance with the needs to be met and their goals for the future. Due to the qualitative nature of this information, we decided to use interviews as our data gathering technique. Since there are only twelve members and each member's ideas were of interest we chose individual interviews. Being unsure of potential answers, we adopted a format that allowed for spontaneous adaptation thereby guaranteeing the most detailed information possible. The specific type of interview chosen was a semi-standardized, topical interview, which allows for variation from a standard set of questions to explore unpredicted topics that arise (Berg 61, Rubin 29-30). The arrangement of the interview led from general questions with obvious answers to more specific thought provoking questions (See Appendix A). The interview was then pre-tested on adult professionals according to social science procedures, to insure that the questions' wording and order conveyed our intended meaning.

Library Staff

The library staff was in possession of information that could be used to design the catalog and training programs. Understanding the roles that each staff member play s in the library would allow for the incorporation of options that facilitate different jobs, such as recording circulation information, into the catalog. In order to design a comprehensive staff-training program, their experience levels with Microsoft Access and web browsers had to be taken into account. In addition to providing information defining their needs, their interaction with the patrons introduces a unique perspective into problems that patrons face with the current cataloging system. Insight into to this perspective would potentially uncover faults in the existing system that can be eliminated in the electronic catalog design.

While the data obtained from the staff requires the previously described interview format for the same reason as the Library Association, additional factors were also considered when choosing the interview type and question order. Unlike the Library Association interviews, where information was not directly related to the respondent, the staff needed to be asked personal questions such as, "Have you ever used the Web?" While this may seem impersonal to some respondents, we perceived that other respondents might feel that this insults their culture, age, sex, etc. by insinuating their inaptitude with technology. When asking questions that require divulging personal information about oneself, the questions were arranged from general to specific to order to involve the smallest amount of personal risk possible (see Appendix B). The initial questions enabled the researcher to build rapport and to get the respondent personally

committed to the interview, thereby making their answers to personal questions more accurate (Rubin 28-29).

The exact wording of the questions was considered in great detail, even more than with the Library Association interviews, because the staff members were native Thai speakers and not fluent in English. Not only did we have to ask questions in a manner that they would understand, but we also had to consider their customs when ordering and phrasing our questions so that we did not offend them, thereby losing valuable information. These questions were pre-tested on people in the same professional field and on Thai students in order to guarantee that our interviews were clear and compatible with Thai culture.

Library Patrons

Library patrons, who will use the new catalog more than any other group, possessed information that once obtained would allow us to design a user interface that suited their needs and general preferences. We were interested in exposing opinions they've formed through use of the current catalog focusing on what features they appreciate in the system and what features they dislike. Features that were mentioned repeatedly as useful were incorporated during catalog design while features that they disliked were discarded. Their experience levels with technology determined how advanced the catalog features could be before they would exceed the level of general patron comfort. In addition, knowing patron preferences and aversions associated with electronic searching would allow us to identify options that they generally favor and could potentially be incorporated into the interface design.

With the timeframe allowed for data gathering and the need for in depth, detailed transcripts that covered areas that could not be accurately predicted with our limited knowledge in the area of research, a fast dynamic data gathering technique was required; in short interviews. The semi-standardized, topical interview was chosen because the information to be obtained was thought provoking and of a potentially sensitive nature as in the case of the staff. The interview questions were therefore ordered from general to specific according to the same principles as the staff and Library Association questions (See Appendix C).

Since the library has roughly five hundred patrons we needed to develop a sampling method for selecting respondents that would give us as broad a base of information as possible. The first step in enhancing the information pool consisted of dividing the patron base into frames or groups that could be identified and sampled. The first division that we considered involved classifying the patrons by frequency of library use. However, in examining the patron information packets, which include usage records, it became apparent that since nearly all of the patrons visit the library on a regular basis, distinguishing between frequent and infrequent users was not feasible. A potential division method that became apparent during this same examination was to divide by the four membership types: adult, senior citizen, student and family. These groups could be representative of different motivations for or methods of library use and therefore provide different information, which would serve to meet our aim of obtaining the largest range of information possible. The library's patronage was also representative of three main cultural groups whose responses could be culturally founded, which would also broaden the range of opinions that were obtained.

After determining that coverage of these seven frames was the best option available for broadening the base of opinions going into the catalog's design, we then had to develop a sampling method. Since these frames do not attempt to represent the patronage as a whole and their results have no statistical basis, we proposed convenient sampling, which would allow for obtaining the necessary information in the least amount of time possible. In consulting field notes from the observation period, it was confirmed that this method of choosing respondents, based on who entered the library in a given week, would provide accurate coverage of the identified frames.

3.2 Develop design criteria through data analysis

The objective of analyzing the interview transcripts and observation records was to develop criteria for the design of the catalog interface and the training program. In addition, the analysis served to filter out superfluous information, retaining only the data relating to the design process. Social science provides the general procedure that we will follow for extracting the desired information from the textual data. First the researcher must formulate questions to keep in mind while examining the data. Next the answers to these questions are grouped into common themes. We will use the results of this procedure, the themes, as criteria for the system design and the training program.

The questions that we developed for the first step of data extraction are aimed at information that will assist in catalog and training program design. The first step in developing these questions was to review the aims of the interviews. Afterwards we designed the questions to determine if the desired information was obtained. Our first set

of questions addressed the system's functionality by asking: Why does each group feel that the current card catalog needs to be supplemented? What goals does each group have for the library that need to be reflected in the electronic catalog? Are there any services that the patrons require of the staff that could be incorporated into the catalog? What features of the current card catalog should be incorporated in the electronic version? Which features of the current card catalog should be discarded in the design of the new catalog? The questions that we formed to extract information on user interface are: What features of electronic searching should be included in the catalog design? What features of electronic searching should be left out of the catalog design? Questions were also developed for the extraction of information on training program design: Could the staff members enter information into Access without instruction? Is the staff capable of using a search engine interface without instruction? These questions were limited to the staff, as our preliminary research showed that if patron-training sessions were provided for patrons, they would not be used. However, if the staff were well trained, they would be able to teach the patrons on a case-by-case basis (See Section 2.4.1). The answers to the three question sets outline the desires and needs of the catalog's potential users.

The answers to the extraction questions provided us with criteria for the design process. Two types of criteria were formed: essential criteria and subordinate criteria. Essential criteria were developed from common answers to extraction questions, defined as themes. Subordinate criteria, resulting from ideas that had little or no corroboration, were incorporated into the interface design only if they added functionality to the system. Even if they were incorporated subordinate criteria were implemented as options, so that users who disliked the ideas would not have to use them.

3.3 Design catalog and training program

In order to tailor the catalog, designed using the library's resources, and training program to the preferences and abilities of the library staff and patrons, we applied the criteria developed through data analysis to the design process. These criteria governed the format of the interface by defining the options to be incorporated, the help sections to be included, and the searching techniques to be employed. Once the interface was complete, we had to test the catalog through intensive use of all the options, including entering incorrect information to see how the catalog reacts. After the catalog was tested and ready for use, design of the training program was finished. The training program also had to meet criteria by explaining not only basic system operation but also any options incorporated during the interface design.

The interfaces were designed to perform desired functions based on criteria developed during data analysis. In order to meet the needs of the library's staff and patrons and provide adequate security measures, two interfaces were designed for the catalog. Together the two interfaces, server-side or maintenance interface and the client-side or searching interface, facilitate the necessary functions of the catalog. The design process of each interface consisted of first looking at hardware and software available, a computer purchased for the catalog (See Appendix D) and Microsoft Access, then considering the options to be incorporated, and finally adding those features if they were supported by the software and feasible to implement in the amount of time we were given.

After the initial system has been created, it must be tested to ensure that all of its features function properly under any circumstance. The ability to function also extends to error handling or how the catalog reacts when information has been entered incorrectly. For example, if a search is attempted without specifying a search term, the catalog has to recognize the error and report it back to the user without the use of any computer jargon. The catalog was tested by extensive use of all the features by us, and by several Library Association members who volunteered as testers for a small amount of time. By allowing different people to test the catalog, we could notice bugs that we may not have realized on our own.

The training program design was dependent on the software used, the staff's familiarity with that software and any options incorporated in the interfaces. We had to expand their knowledge of software applications to include catalog management. The staff had to know how to utilize any additional features that had been incorporated. Therefore, the training program design included an extensive demonstration of all of the catalog's functions.

4. Results and Analysis

By following the steps laid out in Chapter 3, we developed criteria, and applied them to the design of the catalog and training program. These criteria identified roles that the catalog should fulfill as supported through interviews and observations. Specific features incorporated in the final design addressed each criterion and the staff training session reflected the features implemented in the catalog.

4.1 Catalog Design

The themes and ideas that were identified through our research resulted in six criteria. There were three essential criteria developed including the incorporation of subject searching, the need for Internet compatibility, and the necessity of the system being user friendly. In addition three subordinate criteria were identified and consulted as suggestions during the design process. Unlike the subordinate criteria, which were optional, the essential criteria were treated as system requirements. In addition to developing criteria from our results, we also used the data to gauge support for our project.

Prior to the design of system criteria, the support level for investment in an electronic system was gauged. We found that the Library Association, the would-be purchasers of the system, unanimously supported this investment. More importantly, through interviews we determined that almost all patrons would support the system.

While the first essential criterion, inclusion of a subject index, was a guideline for our project, it was necessary to verify its support more broadly. The need was readily verified by a majority of the patrons interviewed responding that the current catalog could be improved by the addition of a subject index. Further support came from patron descriptions of their subject searching techniques. Over half said that they had to consult the librarian to locate books on a particular subject. Other patrons said that they used their knowledge of the collection's layout to guide their subject searches. The patron responses were triangulated by observations that noted patrons consulting the librarian in this way and patrons browsing particular shelves in the collection. The resulting feature in the catalog is the ability to search by subject in addition to the standard author, title searches.

All user groups support the system's eventual availability over the Internet and therefore the second essential criterion was that the system had to be Internet compatible. In addition to unanimous support from the Library Association for the system going online, the staff's presumption that the system would be on the Internet due to the implicit ease of use that they associate with Internet applications lent further support for this option. While no patrons were opposed to the idea, over half the respondents thought that they would use the Internet option if it became available. In order to accommodate an easy transition to its future format, the catalog interface took the form of a web page.

Due to the vast majority of patrons expressing the desire for the system to be "user-friendly" the system was designed with ease of use in mind. However, the definition of "user-friendly" differed between the patrons. Multiple patrons expressed a

dislike of searches that required navigating through multiple links to get to desired information. Several patrons also revealed frustration with unclear instructions, which could be classified as those including technical jargon. A few patrons went on to say that they preferred systems that allow for immediate access to the desired information without scrolling through information unrelated to their search. These opinions express the patrons' familiarity with the concept of searching on web search engines, which further supports the usage of a search engine format similar to Altavista or Yahoo. In addressing the "user-friendly" criterion, the system was designed with clear links, layman term instructions and minimal scrolling.

Contrary to popular belief the library serves both the leisure reader and researcher; therefore the catalog needs to address the searching needs of both groups. Characteristics specific to leisure readers interviewed were an appreciation of systems that provide a large number of hits and frustration with searches that leave them without any information. A small number of these patrons felt that the lack of hits was due to searching using the wrong synonym. In contrast, all researchers interviewed support searches that supply specific, detailed results. They are in agreement with the AACR idea presented in 2.2.2 that if a search yields no exact hits it simply means that the information is not available in the library. Unlike the leisure readers who like to be exposed to multiple topics while searching, the researcher desires only information directly related to his search. In order to accommodate the aims of leisure readers and researchers, we will include an option that searchers can use to indicate the desired accuracy of their results.

Regardless of the type of search being conducted, the results provided need to supply many details about the book; this constitutes the second subordinate criterion. Both patrons and Library Association members expressed a desire to have book descriptions and reviews available as a tool for choosing reading materials. There was also small patron interest in having a book referral option, which would provide the reader with additional texts that could be of interest. Multiple patrons, the previous librarian and Library Association members explained that having a book's circulation information available in this system would be helpful. These patrons felt that this information would ease their searching by allowing them to determine if a book was on the shelf or could be reserved. The librarian and the Library Association felt that the incorporation of this information would increase staff efficiency. Another detail the a few patrons would like included is some description of the book's location in the library. A few patrons stated that the library organization was foreign to them and that even when using information from the current card catalog, the location of the book on the shelves was still a mystery. The fields incorporated into book entries as options based on these responses were a map indicating the cabinet of its location, book reviews, circulation information, and book referrals.

The last subordinate criterion of the system is that it should assist the staff in becoming more efficient. One Library Association member introduced this idea during the interview process and when proposed to the other members was accepted with enthusiasm. The specific suggestion was that the new catalog could assist in the maintenance of the current card catalog by printing out cards. Due to the strong support

for this option and the level of functionality that it adds to the catalog, we incorporated card printing as a catalog feature.

4.2 Catalog Specifications

From the design criteria, we developed an electronic catalog that met the needs of its users. There are three prominent aspects of this catalog: the database, the catalog interfaces, and the hardware. Each of these aspects is an integral part of the system and serves to meet certain needs. The database contains all of the catalog information, the interfaces allow the library users to access and update the catalog, and the hardware provides the physical support.

4.2.1 The Database

The choice of the programs for the catalog database was limited to what was available at the library or what the library could afford. Microsoft Access was chosen since the library was already in possession of a copy as they use it for their membership lists. The database that will actually be storing the catalog must contain all information that is relevant to each text such as: Accession number, title, author, publishing information, and subject classification.

The first field in the database, called the accession number, is the primary key for the database. The primary key is a unique number that is assigned to each book, so that all database entries are distinguishable from one another, regardless of whether or not entries have similar data. Accession numbers are relatively new to the library, so not all

books have been assigned numbers yet. These numbers do not require any particular order, so books that don't have them are assigned numbers sequentially as they are entered into the catalog.

Along with the basic information of Author, Title, Publisher, etc., the database also provides support for extensive subject classification. This support was implemented to allow the patrons to conduct a more thorough subject search. The fact that a librarian stated that some books have been argued to belong to several different Dewey numbers gives another reason for this capacity (Sandberg, 2001).

Two fields were added to the database specifically to reflect patron needs: Circulation_information and New_book. Circulation_information was provided to allow the librarian to keep track of the circulation status of the collection. The New_book field was included in the database to keep tabs on which books were located at the new book table in the library. Table 1 shows the full structure of the database, listing all the fields, and providing descriptions where necessary.

Field Name	Description (if needed)
Accession_number	The accession number is the library's unique identifying number for each book
Call_number1	Dewey Decimal number
Call_number2	Additional fields in case the book can be placed under more than one Dewey Decimal number
Call_number3	
Cutter_number	Code representing the author
Author	Author of the book
Author2	Secondary authors (if applicable)
Translator	If applicable
Illustrator	If applicable
Title	
Subtitle	If applicable
Publisher	
Place_of_publication	
Date_of_publication	
Date_of_copyright	
Number_of_pages	
Size	Height of the book along it's spine
Cover_type	Hard Cover, Soft Cover, or Paperback
Genre	The genre of the book, as defined by the librarian
Date_entered_in_collection	The date the library received this book
Copy_number	For multiple copies of the same book
Source	Place of purchase
Price	Price of purchase in respective currency
Subject1	Description of subject matter according to integer digits of the Dewey number
Subject2	Description of subject matter according to decimal digits of the Dewey number
Subject3	Description of subject matter according to integer digits of the secondary Dewey number (if a secondary number has been assigned)
Subject4	Description of subject matter according to decimal digits of the secondary Dewey number (if a secondary number has been assigned)
Subject5	Miscellaneous subjecting information
Subject6	
Misc1	Any miscellaneous cataloging information about the book
Misc2	
Circulation_information	Indicates whether or not book is checked out
New_book	Defines the book as new

Table 1: Database Fields with Descriptions

4.2.2 The Catalog Interfaces

The database serves as the backbone for the searching and administrative interfaces, which is what will be used to implement the criteria described in the section 4.1. First we discuss the searching interface, which will be used by library patrons for accessing the catalog, and then we examine the administration interface, which will be used by the library staff for maintenance.

As mentioned in section 4.1, a web page interface was decided upon in order to facilitate easy transition to the Internet. In order to smooth this transition even further, the interfaces were designed in such a way so as to look similar to Neilson Hays Library's current web page. Making these pages function in the same manner as a search engine and an information entry page will also ease the users transition between the electronic version and the Internet available form. All of the code for the catalog interfaces is contained in AppendixE.

Searching Interface

One criterion that we addressed with the searching interface was the idea of easy catalog searching by avoiding excessive links or scrolling. This issue was addressed by allowing the user to enter their search on the very first page. Minimizing the number of options for the search and providing clear explanations of each is how we have addressed the criterion of being user friendly. Figure 1 illustrates what the user will see when the catalog is first opened.

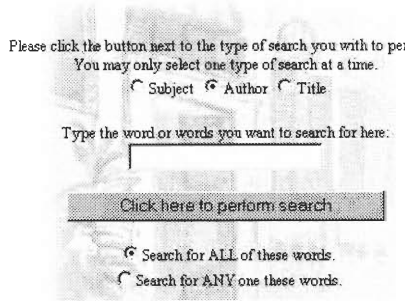


Figure 1: Searching Interface

Also displayed in Figure 1 is an option to determine how specific a search is. The two radio buttons below the search field. The button that states, "Search for ALL of these words," performs the desired search, picking out only those books that contain all of the words entered. The other option searches for books that contain one or more of the search entries in the desired field.

When a search is submitted, a page displaying the search results is displayed. This is accomplished by calling PHP code that searches the database for the search term that was entered, and generates an HTML table that displays the author, title, and Dewey Decimal number of each book that was found. As an example, the Figure 2 displays the result page that is generated when a subject search is performed in non-fiction for the term "journalism."

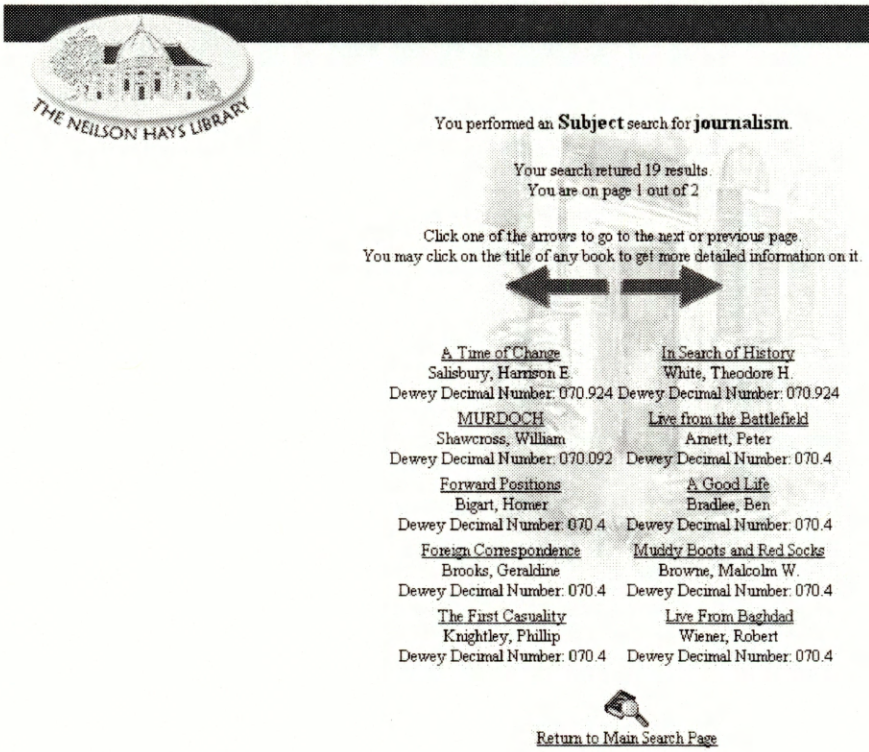


Figure 2: Results Page

As mentioned patrons mentioned that they found excessive scrolling annoying, the results page limits the number of books shown to ten. The patrons can find the rest of the books by clicking on the arrow buttons, which takes them to the next results page. Brief instructions are also provided, in order for the page to be as easy to understand as possible.

The result page also shows how we have dealt with the criteria of providing detailed information on each book. As described above, users can click on the title of the book to get more detailed information. When a book title is clicked, the web page calls PHP code that retrieves all the information on that book. Figure 3 shows the page that is generated when a book title is clicked.

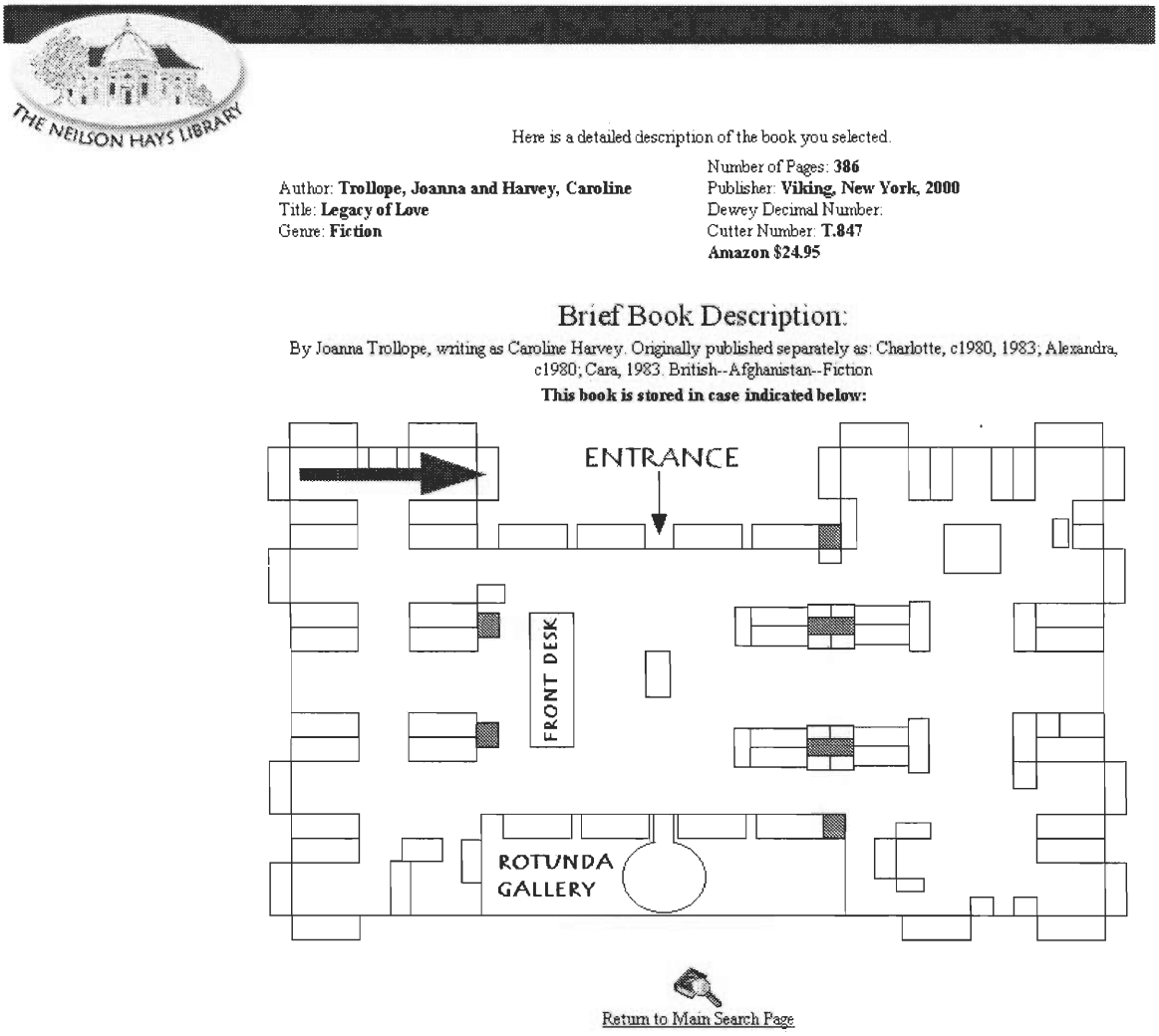


Figure 3: Book Details Page

This details page displays information that the database holds on the book. This page also shows the location of the book in the library, which is important because some patrons expressed the idea that finding a book in the catalog doesn't tell them where the book is physically located in the library, but rather gives them a number that they have to locate for themselves. Another feature that appears on this additional information page is a brief description of the book, if it has been entered. Book descriptions are not

contained in the database, but are rather stored in the form of text files. The staff interface has an option for entering this description.

The Staff Interface

The staff interface is completely hidden from the searching interface, so that catalog searchers are not confused by administration options. In order for the staff to get to the administration interface, they will open a separate web page. The administration interface also has password verification, which is supported by PHP. This will prevent the catalog from being accidentally edited with false information. The administration interface has a few different options: Enter/Update Catalog Entries, Print Catalog Cards, Edit Library Map, and Enter Circulation Information, as shown in Figure 4.

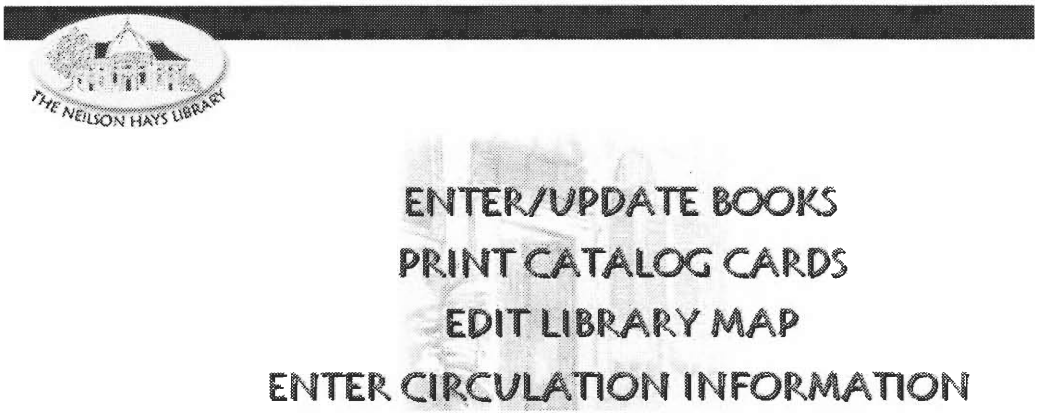


Figure 4: Administration Index Page

The catalog entry option brings the user to a new page that will prompt them for either the accession number of the book they wish to enter. If the book has not been entered yet, the catalog will create a new entry in the database with that accession number. The user will then be able to enter the book's information into the catalog.

However, if the book has already been entered in the catalog, the book entry will display the current information of the book and the user will be allowed to change them, if so desired. Figure 5 illustrates a sample book entry page:

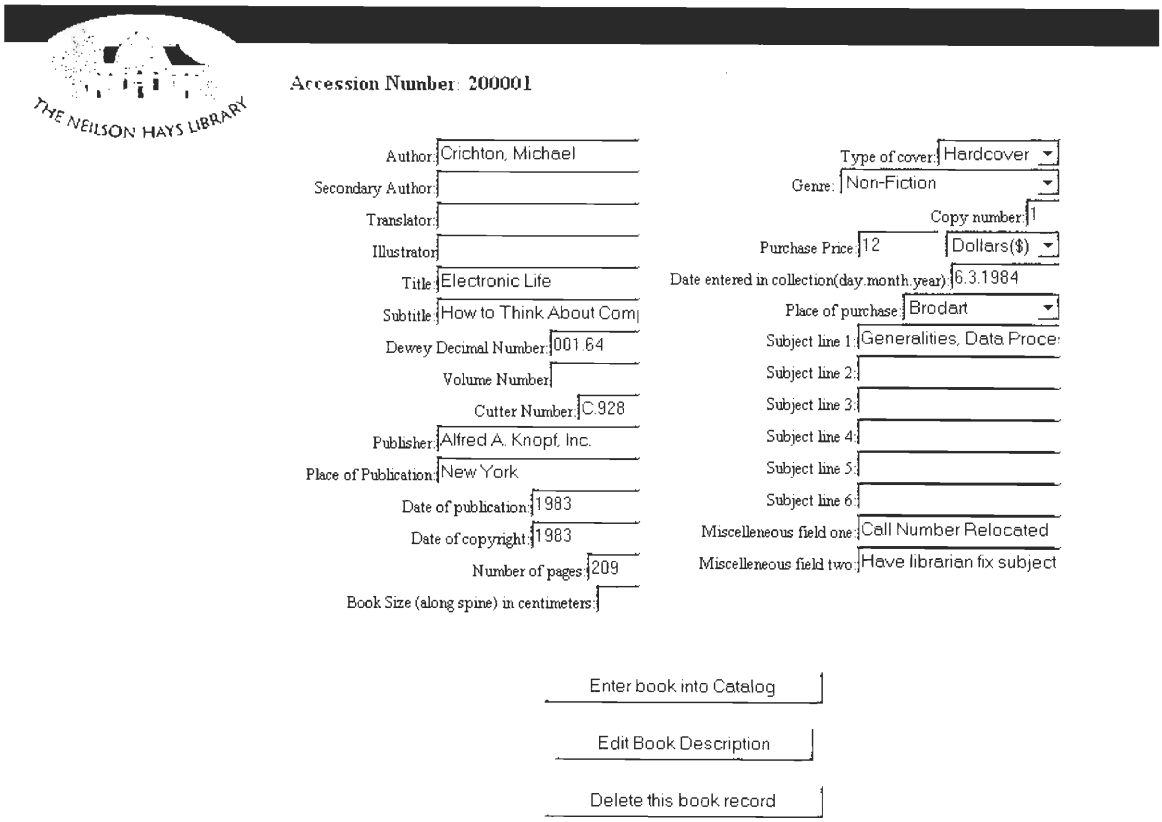
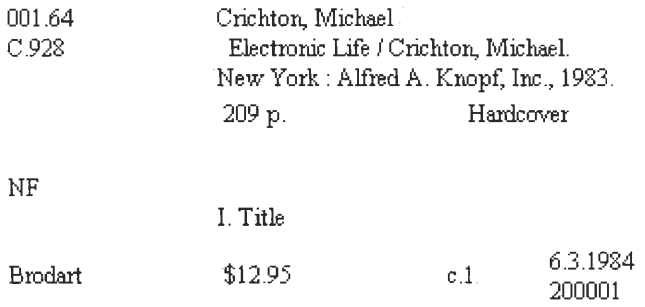


Figure 5: Book Entry Page

Notice that this page also gives the option of entering a book description. As discussed before, the book description option is how we have chosen to address the criterion of obtaining detailed information on each book. By clicking on this option, users are allowed to create or edit the description of the book they are examining. As previously mentioned, the descriptions are not stored in the actual database, but rather in external text files that PHP creates and reads. Users who search the catalog can then read

the descriptions on the extended information page, so that they get a general idea of the contents of each book.

The catalog card printing option was implemented in order to address the criterion of assisting the jobs of the staff. This link will allow the staff to indicate the accession number and the type of card they want, author, title, or index, and the catalog will generate a web page that displays the catalog cards for that book from the information in the database. This page can then be printed out onto cards and utilized in the card catalog. Figure 6 shows what the final appearance of the catalog cards would be upon entering the book's information.


001.64
C.928

Crichton, Michael
Electronic Life / Crichton, Michael.
New York : Alfred A. Knopf, Inc., 1983.
209 p. Hardcover

NF

I. Title

Brodart $12.95 c.1 6.3.1984
200001

Figure 6: Generated Catalog Card

The next option, configuring the library map, is included to ensure the accuracy of the map that is displayed in the searching interface. When this option is selected, the user is prompted to select a bookcase from a map of the library. Once selected, the user may enter the range of books to be found in that case. The range is given the genre of books in the case, as well as either a range of Cutter numbers, for fiction, or Dewey Decimal numbers, for non-fiction. The information entered here will be stored by PHP as a text

file, which the searching interface will access to determine the book's location. Figure 7 shows how the map editing options will appear to the user:

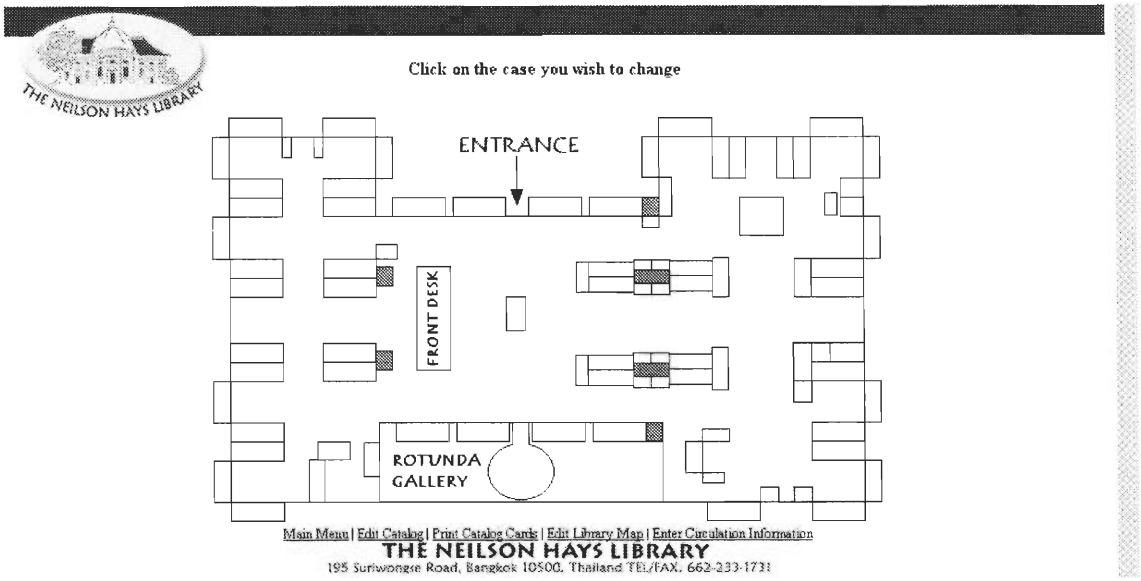


Figure 7: Map Editor

The "Edit New Books Table" option allows the librarian to specify which books are located on the New Books Table in the library. This is an important feature because books that were recently acquired are placed on this table for a short time, meaning that they will not be in their proper location on the shelf, making the map inaccurate. The option allows the user to edit the New Book list, which in turn will edit the 'New_book' field in the books that were added to or removed from the table. This feature will allow patrons to locate books on the new book table when they are found in the catalog search.

The last option that is presented on the administration page is to enter circulation information. This option brings up a web page that lists all the books that are currently checked out, and displays a series of blank fields. The page also prompts the user to enter

the accession numbers of all of the books that were checked in or out of the library that day. The PHP code behind this page will change the 'Circulation_information' field in the database, and allow the catalog to tell patrons if a book is currently available in the library. This ability allows the patrons avoid searching for books that are currently checked out of the library. Shown in Figure 8 is the web page that results from clicking on the 'Enter Circulation Information' link:

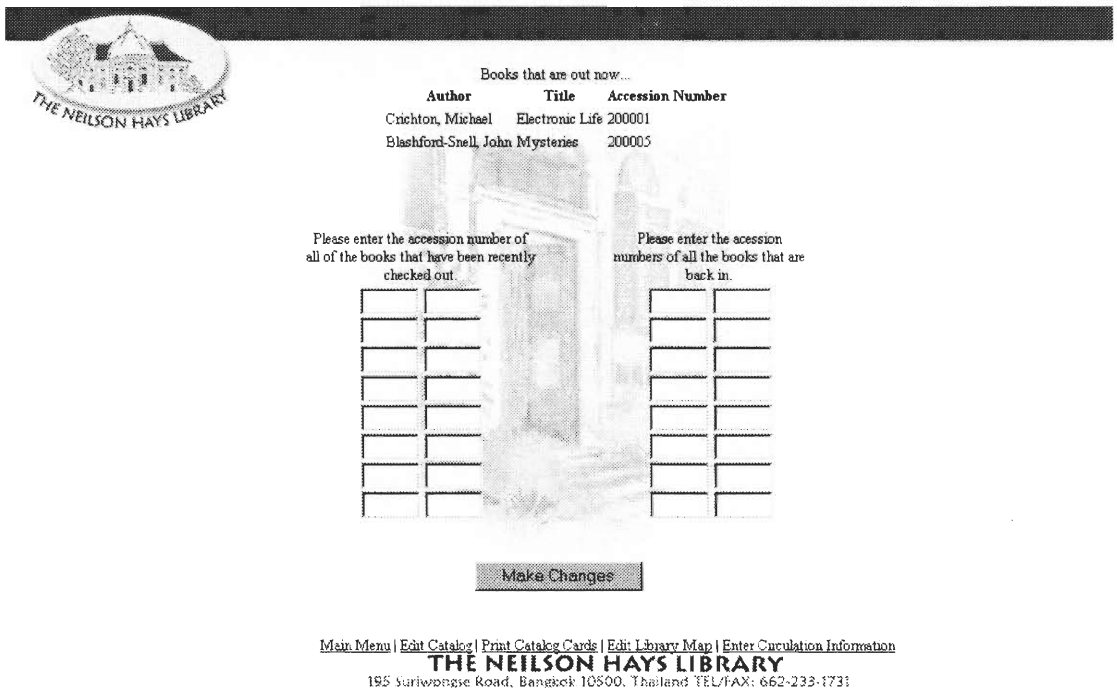


Figure 8: Circulation Information Screen

4.2.3 The Hardware

In order to provide an electronic catalog with these features, adequate hardware is required. Many of the patrons expressed frustration with slow web pages, and for this reason we must ensure that the system can process queries quickly. Another theme that

came across in our interviews was the long-term goal of making the catalog available on the world-wide-web. We must employ hardware that is capable of supporting web browsers and Internet connectivity. Another important requirement of the hardware is some type of backup method. If there were to be a failure in the computer's hard drive, the catalog would have to be re-entered from the beginning. This hassle could be avoided by providing some means of backing up the catalog in the event of an emergency. Most computers available today can easily provide the speed and connectivity required to run the catalog. A reasonable speed for the processor of a computer that would run the search would be around 200-300 MHz. A computer of this speed could be purchased for several hundred dollars, which is a feasible cost in terms of the library's finances. Backup for the catalog can be provided in the form of a zip drive. Zip drives allow for over 100 megabytes of disk storage, which will be more than sufficient for backing up the entire catalog as well as all of the associated PHP and HTML code.

4.3 Training Design

In order to ensure the staff's understanding of the catalog interfaces we developed a training session based on their experience level, determined through interviews, and the final setup of the catalog itself. The training program aimed at guaranteeing their comfort with the functionality of the system and the specific options that we incorporated into each interface. The training session had two parts, the explanation period and the question phase. The details of the explanation section were the result of the staff

experience levels, while the question and answer period was designed provided us with valuable information about the system, as well as helping the staff understand the catalog.

Through interviews with the staff we determined that the librarian should be the primary trainee, as she is the staff member that has the most contact with the new catalog and patrons in general. However, due to her absence we have decided to train the Library Association member in charge of training new staff. Two other Library Association members were also trained, as they had expressed interest in learning how the catalog worked.

The trainees had to be trained to be able to enter new books into the catalog's database, in order to keep the catalog up-to-date. This training allowed the trainees to be able to define the subject field of a book, as well as fill in all other required information. In addition to maintaining the catalog, the training included explaining the functionality of the patron end of the catalog. Specifically this means that the trainees were made aware of how to utilize all the options available to the patrons. In this way, the details of the training program were dependent on the added functions of the catalog.

The trainees' knowledge of the software being used and electronic cataloging systems in general determined the explanation section of the training session designed. Through our interviews, we determined that all of the trainees had previous knowledge of how to use both Microsoft Access and the Internet. This knowledge allowed us to choose training by demonstration. This type of training allowed us to explain all of the functions of the catalog while providing the trainees with valuable hands-on-experience at the same time. The demonstration took them step-by-step through entering books, accessing and searching the catalog, as well as the usage of all the added options.

The second part of the training session was the question and answer period. This section of the training program consisted of answering any questions the trainees had about the catalog, and making sure they felt comfortable with it. All in all, the trainees asked very few questions about the interfaces, they all seemed to understand how to work the catalog almost right away.

In addition to helping the trainees, the question and answer period of the training program served to help refine the catalog's functions. Any troubles they expressed with the catalog were worked through, and minimized with their suggestions. An example of this was the card printing. Through the question and answer period they suggested the current layout of card printing page. Previously it had displayed the information incorrectly and in an awkward way. Through their ideas, we were able to simplify the process and provide the correct information.

5. Conclusions and Recommendations

By sponsoring our project, the Neilson Hays Library has continued along the journey of incorporating technology to better serve its clientele. However, the technology has always been hidden to preserve the atmosphere of the library. The first step was the addition of air conditioning, which increased the comfort of the patrons and helped to preserve the collection while leaving the library's aesthetics in tact due to its wooden cases. Next, the development of a web page made the library visible from the World Wide Web, and allowed for a listing of additions to the collection to be available at the click of a button; as of yet this addition is not available from within the library and does not affect the atmosphere. Our project has assisted the Library in continuing its incorporation of modern technology by supplementing its card catalog with a new electronic catalog, while also proposing methods of preserving the atmosphere of the library. In addition to meeting the current needs of the library, this system was designed to be dynamic making the incorporation of recommendations and adaptation to meet future needs easily facilitated.

The electronic catalog was designed to meet the current needs of the catalog users, according to information obtained from interviews with Library Association members, the staff, and the patrons. Not only was each group in support of the new system, they were able to offer useful suggestions for what functions it should perform and how the catalog interfaces should appear. In order to facilitate desired functions and provide user-friendly interfaces, as well as providing a method for easy movement to the Internet, we concluded that a web interface would be the best approach.

Part of our project was to partially implement the system for use in the training program and to test the design. When entering books we were able to identify areas that were troublesome and develop methods to simplify the process. These methods are reflected in the demonstration portion of the training program. Entering books also allowed us to pretest the system that we had designed. We were able to run test searches and experiment with different options that had been incorporated into the catalog.

Two recommendations have been developed that should be taken into account during the continued implementation of the electronic catalog. First, the following procedure should be used for entering books. The Non-Fiction collection should be entered sequentially, starting at Dewey Decimal number 001. Circulation cards of the entered books would be marked so that on being returned, books that had not yet been entered could be identified. New books would also be entered as they came into the library. Once the Non-Fiction section was complete, that section would become available through the catalog. This procedure would then be repeated for the Fiction and Children's sections. This would allow the patrons the ability to search the Non-Fiction section as soon as possible. The other recommendation to be considered when entering the collection is inclusion of the paperback books. The addition of this section to the catalog would allow searches to provide results representative of the entire collection. Following the recommended procedure will provide the fastest path to the functional system.

The catalog design contains options that we recommend are only utilized once the catalog is complete. The field denoting if a book is considered new was designed to alert the patrons to the fact the book is on the new book table instead on a shelf. Since books

that are classified as new have the potential to be shelved before the catalog is complete, we advise that this field only be used immediately prior to the time that the system is made available to the public. The second option that was included was that of the circulation information. This field would allow the patrons to know if a specific book had been checked out. In this way patrons would avoid having to search the shelves to ascertain whether a book is available or not. As books are constantly being checked in and out, to keep this function up-to-date along with updating the catalog would be very difficult. The last option is that of Internet availability. As this option had the support from all catalog user groups, we highly recommend that this preference be heeded. Internet access would allow patrons to search the catalog while outside the library, perhaps saving them a trip through Bangkok traffic if the library doesn't have the book he or she wanted.

Recommendations as to the electronic catalog's future functionality were made based on the current needs of the library's patrons that were identified, but that could not be met until the catalog went online. The first of these recommendations is the idea of remote book reservation; allowing the patrons to, once the catalog is online, reserve books from outside the library. Another recommendation is for the catalog to be linked to other libraries so that searchers will be exposed to a broader range of materials. These first two recommendations would require some sort of technical expertise that could be supplied by the individual(s) or company that put the catalog online. Some interviewees had also suggested the idea of allowing general computer use, by making the catalog's computer available to the patrons for use the computer in other activities such as email or web searching. This would allow patrons to educate themselves about general computer

and Internet use if they do not have access to a computer. We are including this idea among our recommendations, since many of the patrons expressed an interest in Internet searching and found it to be generally useful.

There are many positive long-term effects that this electronic catalog could have on the library. These effects are, in general, linked to the system itself, as great care was taken to eliminate any detrimental consequences that could affect the library's historical atmosphere and appearance. The system was placed on the librarian's desk in a wooden case, as a compromise between the patrons who would like the system to be placed out of the way to preserve the library's aesthetics and the patrons who would like the system placed near the entrance to promote its usage. This placement would not only allow the patrons easy access to the librarian's help, if needed, but would also make the computer available to the librarian for maintenance purposes. The catalog could serve to increase the library's usage as a research institution and further assist the leisure reader in the location of reading materials. Expanding the collection's reference materials and newly published books could further facilitate the increase in usage, as patrons have suggested. This more complete usage of the library's resources could attract new members to the library. The catalog may also provide patrons with exposure to computer use that they may not have received elsewhere. This catalog serves as one of the first and certainly the largest step towards the modernization of the Neilson Hays Library.

Appendix A: Board Member Interview Questions

Interviewer: Hello, my name is (blank). This is (blank). We've come up with a few questions that we think the answers to would be greatly beneficial to the catalog modernization project. We're going to start out with some questions that will provide us with background information on the library. Then we hope to gain a better understanding of the project. At the completion of the question period, we will introduce the goal of our project and request your feedback. Do you have any questions before we begin?

Our first question is:

What do you think is the most important role that the Neilson Hays Library plays in Bangkok society? (Possibly follow up with: How did you arrive at this conclusion?)

Do you see that role changing in the future? (If yes, then: How do you see it changing?)

What are some goals that you would like to see the library reach in the future? (Possibly follow up with: How far away do you perceive their accomplishment to be?)

What was the motivation behind the catalog project?

What long-term effects do you expect to see result from this project?

The goal that we have set for our portion of the project is: To design a system by which the Neilson Hays Library can implement an electronic catalog with subject index. This system will be designed such that the library's staff and patrons can use the system with only basic computer knowledge supplemented by a brief training session.

Do you have any questions or comments?

Thank you very much for your time. We look forward to working with you.

Appendix B: Staff Interview Questions

Could you please describe your job?

How long have you worked at the library?

Do you think the electronic catalog will change your job in any way?

If yes, how do you think it will affect your job?

Do you use Microsoft Access in your work at the library?

If yes, how often do you use Access?

What do you use Access for?

Have you ever used the Web, Internet, Explorer, Netscape?

If yes, how often do you use it?

If choosing between the Web and Access, which one are you more comfortable with?

If preference, why do you prefer _____?

What is the most common question asked by library patrons?

Thank you so much for your time. This information will be very helpful.

Appendix C: Patron Interview Questions

Introduction: Hello, my name is _____ . I am one of the three students from Worcester Polytechnic Institute that is assisting the library with its improvement study. Did you receive the letter sent out by the Library Association? If no, are you a member of the library? If yes, you might want to check your address with the circulation desk. Would you be able to donate 15 minutes of your time to participate in a confidential interview aimed at determining your needs as a patron of this library? Thank y ou.

As I was saying before, I'm a student at WPI and this project also fulfills one of my degree requirements. Say something that leads into being in Bangkok, for example: [I think that it's wonderful to be able to complete this project in Bangkok. We've only been here for 3 weeks but we're in awe of the culture.]

1. How did you find out about the library?
2. Was there anything that you particularly liked about the library that made you join?
3. How long have you been a patron of the library?
4. What type of membership do you have?
5. How often do you come into the library?
6. What do you use the library for, primarily?
7. Have you ever been (or are you) a patron of other libraries? Elsewhere? If no, skip to 15.
8. Are there any notable differences between the libraries? Could you describe them?
9. Did any of these libraries have an electronic catalog?
10. Did you use it? Why? Why not?
11. What did you like about the catalog?
    Dislike?
12. Was the catalog online? If not answered in 8-10.
13. Did the catalog have a subject index? If not answered in 8-10.
14. Did you ever use the subject index to locate books? If not answered in 8-10.
15. If you wanted to locate a specific book in this library, how would you go about it?
16. Have you ever used the card catalog when searching for a book? Like/dislike?
17. If this catalog could be changed in any way to make it easier to use, what would the change be? Get lots of info…if mention electronic catalog, then 19, if not then 18.
18. If the library supplemented its current card catalog with an electronic catalog with a subject index, would you use it?
19. If a computer were to be incorporated into the library's cataloging system where would you prefer it to be placed?
20. If used online, if not skip to 22. You said that you've used an online catalog can you remember anything that you did like about the way the catalog was set up?
21. Was there anything that you particularly disliked?
22. Have you ever used the Internet outside of a library?
23. Is there any specific web page that you frequent?

24. Can you describe things that you like about it?
    Things you don't like?
25. If the library's catalog were made available over the Internet, would you find it helpful?
26. In your experiences as a library patron, can you think of any improvements that the library could make that would enhance the library's services?
    a. Could you elaborate on that?
    b. Do you have any more suggestions?

Thank you for your time ☺

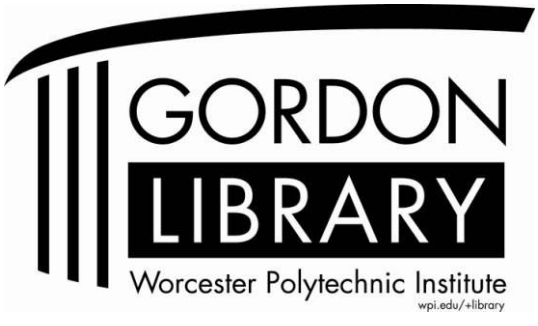
Appendix D: Hardware Profile

IBM NetVista®
- Celeron® 466MHz
- 56 Megs of RAM
- 10 Gig Hard Drive
- 15" Monitor
- 56k V.90 Modem
- Integrated Network Card
- Windows ME®

HP DeskJet 630c

Attached disk was empty

IQP/MQP SCANNING PROJECT



Appendix E: Catalog Source Code

See attached disk

Appendix F: Patron Observations

See attached disk

Appendix G: Interview Responses

See attached disk

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