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ABSTRACT

DIGITAL LIBRARY DEVELOPMENT: A CASE STUDY OF NEW JERSEY'S VIRTUAL ACADEMIC LIBRARY ENVIRONMENT PROJECT

by
Paulette Joan Talbot

Students could become aggressive users of digital libraries and electronically distributed information. This paper shall give background of digital libraries in general and of New Jersey's Virtual Academic Library Environment, VALE, specifically. It shall emphasize research into the dynamics of user and organizational aspects of VALE member organization performance in framing a direction of libraries in the state for years to come. Does the academic libraries of VALE focus on value added to information resources in the academic arena or are the potential users their primary focus?

DIGITAL LIBRARY DEVELOPMENT: A CASE STUDY OF NEW JERSEY'S VIRTUAL ACADEMIC LIBRARY ENVIRONMENT PROJECT

by
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A Thesis

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APPROVAL PAGE

DIGITAL LIBRARY DEVELOPMENT: A CASE STUDY OF NEW JERSEYS VIRTUAL ACADEMIC LIBRARY ENVIRONMENT PROJECT

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This thesis is dedicated to the memory of my grandmother
Francis A. Wright

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LIST OF SEARCH ENGINE AND INFORMATION RETRIEVAL GLOSSARY

This page gives definitions for some terms relevant to Information Retrieval, (IR) and Search Engine. Some terms are used in both areas and are designated as such in this excerpt. It is generic in nature and attempts to define only some and not all terms relating to Information Retrieval and Search Engine.

TERM	DESCRIPTION
Boolean query	A query that is a Boolean combination of terms. Some examples are INFORMATION AND RETRIEVAL, VISION OR SIGHT, and CLINTON AND (NOT GORE).
Boolean search	A search allowing the inclusion or exclusion of documents containing certain words using operators such as AND, NOT and OR.
Classification	The process of deciding the appropriate category for a given document. Examples are deciding what newsgroup an article belongs in, what folder an e-mail message should be directed to, or what is the general topic of an essay.
Cluster	A grouping of representations of similar documents. In a vector space model, one can perform retrieval by comparing a query vector with the centroids of clusters. One can continue search in those clusters that are in this way most promising.
Collaborative Filtering	The process of filtering documents by determining what documents other users with similar interests and/or needs found relevant. Also called "*social filtering.*"
Collection	A group of documents that a user wishes to get information from. See also *test collection.*
Collection Fusion	The problem of combining the search results from multiple collections. This could be tricky since some measures such as IDF (Inverse Document Frequency) will differ across collections, and, if one retrieves a fixed number of documents, it is unclear how many to take from each collection.
Concept search	A search for documents related conceptually to a word, rather than specifically containing the word itself.
Content-Based Filtering	The process of filtering by extracting features from the text of documents to determine the documents' relevance.

TERM	DESCRIPTION
	Also called "*cognitive filtering.*"
Cosine Similarity	See *similarity*
Document	A piece of information the user may want to retrieve. This could be a text file, a WWW page, a newsgroup posting, a picture, or a sentence from a book.
Full-text index	An index containing every word of every document cataloged, including stop words (defined below).
Fuzzy search	A search that will find matches even when words are only partially spelled or misspelled.
Index	The searchable catalog of documents created by search engine software. Also called "catalog." Index is often used as a synonym for search engine.
Indexing	The process of converting a collection into a form suitable for easy search and retrieval.
Information Extraction	A related area that attempts to identify semantic structure and other specific types of information from unrestricted text.
Information Filtering	Given a large amount of data, return the data that the user wants to see. This is the standard problem in Information Retrieval.
Information Need	What the user really wants to know. A query approximates the information need.
Information Retrieval	The study of systems for indexing, searching, and recalling data, particularly text or other unstructured forms.
Inverse Document Frequency	Abbreviated as IDF, this is a measure of how often a particular term appears across all of the documents in a collection. It is usually defined as log (collection size/number of documents containing the term). So common words will have low IDF and words unique to a document will have high IDF. This is typically used for weighting the parameters of a model.
Inverted File	A representation for a collection that is essentially an index. For each word or term that appears in the collection, an inverted file lists each document where it

TERM	DESCRIPTION
	appears. This representation is especially useful for performing Boolean queries.
Keyword search	A search for documents containing one or more words that are specified by a user.
Phrase search	A search for documents containing an exact sentence or phrase specified by a user.
Precision (Information Retrieval, IR)	A standard measure of IR performance, precision is defined as the number of relevant documents retrieved divided by the total number of documents retrieved. For example, suppose there are 80 documents relevant to widgets in the collection. System X returns 60 documents, 40 of which are about widgets. Then X's precision is 40/60 = 67%. In an ideal world, precision is 100%. Since this is easy to achieve (by returning just one document), a system attempts to maximize both precision and recall simultaneously.
Precision (Search Engine)	The degree in which a search engine lists documents matching a query. The more matching documents that are listed, the higher the precision. For example, if a search engine lists 80 documents found to match a query but only 20 of them contain the search words, and then the precision would be 25%.
Pre-coordination of terms	The process of using compound terms to describe a document. For example, the use of the term "*search engine and information retrieval glossary*" to index this page.
Post-coordination of terms	The process of using single terms to describe a document that are then combined (or coordinated) based on a given query. For example, this page may be indexed under the words INFORMATION, RETRIEVAL, and GLOSSARY. We would then have to combine these terms based on a query like "INFORMATION and RETRIEVAL."
Probabilistic Model	Any model that considers the probability that a term or concept appears in a document, or that a document satisfies the information need. A Bayesian inference net is a good framework for this style of model. The INQUIRY system is the most successful example.

TERM	DESCRIPTION
Proximity search	A search where users to specify that documents returned should have the words near each other.
Query	A string of words that characterizes the information that the user seeks. Note that this does not have to be an English language question.
Query-By-Example	A search where a user instructs an engine to find more documents that is similar to a particular document. Also called "*find similar.*"
Query Expansion	Any process which builds a new query from an old one. It could be created by adding terms from other documents, as in relevance feedback, or by adding synonyms of terms in the query (as found in a thesaurus).
Question Answering	The problem of finding the exact answer to a user's natural language question in a large collection.
Recall (Information Retrieval)	A standard measure of IR performance, recall is defined as the number of relevant documents retrieved divided by the total number of relevant documents in the collection. For example, suppose there are 80 documents relevant to widgets in the collection. System X returns 60 documents, 40 of which are about widgets. Then X's recall is 40/80 = 50%. In an ideal world, recall is 100%. However, since this is trivial to achieve (by retrieving all of the documents), a system attempts to maximize both recall and precision simultaneously.
Recall (Search Engine)	Related to precision, a search engine returns all the matching documents in a collection in this degree. There may be 100 matching documents, but a search engine may only find 80 of them. It would then list these 80 and have a recall of 80%.
Relevance	An abstract measure of how well a document satisfies the user's information need. Ideally, your system should retrieve all of the relevant documents for you. Unfortunately, this is a subjective notion and difficult to quantify.
Relevancy	How well a document provides the information a user is looking for, as measured by the user.

TERM	DESCRIPTION
Relevance Feedback	A process of refining the results of a retrieval using a given query. The user indicates which documents from those returned are most relevant to his query. The system typically tries to find terms common to that subset, and adds them to the old query. It then returns more documents using the revised query. This can be repeated as often as desired. Also called "*find similar documents*" or "*query by example.*"
Robot	See *spider (information retrieval).*
Routing	Similar to information filtering, the problem of retrieving wanted data from a continuous stream of incoming information (i.e. long-term filtering).
Search Engine	The software that searches an index and returns matches. Search engine is often used synonymously with spider and index, although these are separate components that work with the engine.
SIGIR	The ACM's special interest group on Information Retrieval. They publish SIGIR Forum and have an annual conference. For more information, check their home page.
Signature File	A representation of a collection where documents are hashed to a bit string. This is essentially a compression technique to permit faster searching.
Similarity	The measures of how alike two documents are, or how alike a document and a query are. In a vector space model, this is usually interpreted as how close their corresponding vector representations are to each other. A popular method is to compute the cosine of the angle between the vectors.
Spider (Information Retrieval)	Also called a robot, a program that scans the web looking for URLs. It is started at a particular web page, and then accesses all the links from it. In this manner, it traverses the graph formed by the WWW. It can record information about those servers for the creation of an index or search facility. Most search engines are created using spiders. The problem with them is, if not written properly, they can make a large number of hits on a server in a short space of time, causing the system's performance to decay.

TERM	DESCRIPTION
Spider (Search Engine)	The software that scans documents and adds them to an index by following links. Spider is often used as a synonym for search engine.
Stemming (Information Retrieval)	The process of removing prefixes and suffixes from words in a document or query in the formation of terms in the system's internal model. This is done to group words that have the same conceptual meaning, such as WALK, WALKED, WALKER, and WALKING. Hence, the user does not have to be so specific in a query. The Porter stemmer is a well-known algorithm for this task. You can download some source code for this algorithm here. (Unfortunately, I do not remember where I downloaded it from originally.) Be careful: stemming the word PORTER in PORTER STEMMER to PORT would allow hits with documents about boats or wine.
Stemming (Search Engine)	The ability for a search to include the "*stem*" of words. For example, stemming allows a user to enter swimming and get back results also for the stem word "*swim.*"
Stop word (Information Retrieval)	A word such as a preposition or article that has little semantic content. It also refers to words that have a high frequency across a collection. Since stop words appear in many documents, and are thus not helpful for retrieval, these terms are usually removed from the internal model of a document or query. Some systems have a predetermined list of stop words. However, stop words could depend on context. The word COMPUTER would probably be a stop word in a collection of computer science journal articles, but not in a collection of articles from Consumer Reports. **What Are Stop Words?** Some search engines do not record extremely common words in order to save space or to speed up searches. These are known as "stop words." **Saving Space** Consider this sentence: *The way to the school is long and hard when walking in the rain.*

TERM	DESCRIPTION
	"The" appears three times. To save space, a search engine might replace it with what is called a marker. The sentence would be stored like this: ** way to * school is long and hard when walking in * rain.* This explanation is simplified, but the point is that using markers can save a lot of disk space. The sentence retains most of its relevancy, and the extra space can be used to store more web pages. **Speeding Searches** Some search engines store every word on a web page but they do not search for certain ones to save time. Consider a search for the *piano player*. The search engine has to make three runs to find matches (again, this is oversimplified). First, it looks for all matches of *the*, then all matches of *piano*, then all matches of *player*. Chances are, just looking for the last two words is enough to find relevant pages. Therefore, to save time, the search engine excludes searching for a select number of small words. It will not "stop" to look for them.
Stop words (Search Engine)	Conjunctions, prepositions and articles and other words such as AND, TO, and A that appear often in documents yet alone may contain little meaning.
Term	A single word or concept that occurs in a model for a document or query. It can also refer to words in the original text.
Term Frequency	Abbreviated as TF, the number of times a particular term occurs in a given document or query. This count is used in weighting the parameters of a model.
Test collection	A collection specifically created for evaluating experimental IR systems. It usually comes with a set of queries, and a labeling (decided by human experts) that decides which documents are relevant to each query. TIPSTER is one of the most prevalent test collections currently. Another useful collection for classification is the Reuters text categorization test collection. Here there are no queries, but the documents are news articles labeled

TERM	DESCRIPTION
	with a variety of topic designations.
Thesaurus	A list of synonyms a search engine can use to find matches for particular words if the words themselves do not appear in documents.
TIPSTER	An ongoing project where various groups and institutions have pooled their resources to solve problems in routing and information extraction. The framework is such that each team can work on a different piece and simply "plug" their application into the general architecture. The project also has a large test collection available.
TREC	Text REtrieval Conference. This group gives IR researchers a common test collection and a common evaluation system. Hence, systems can be compared contrasted on the same data. You can visit the conference's home page for information about the conference and on-line versions of the proceedings.
Vector Space Model	A representation of documents and queries where they are converted into vectors. The features of these vectors are usually words in the document or query, after stemming and removing stop words. The vectors are weighted to give emphasis to terms that exemplify meaning, and are useful in retrieval. In retrieval, the query vector is compared to each document vector. Those that are closest to the query are considered similar, and are returned. SMART is the most famous example of a system that uses a vector space model.
Weighting	Usually referring to terms, the process of giving emphasis to the parameters for more terms that are important. In a vector space model, this is applied to the features of each vector. A popular weighting scheme is TF*IDF (Inverse Document Frequency). Other possible schemes are Boolean (1 if the term appears, 0 if not), or by term frequency alone. In a vector model, the weights are sometimes normalized to sum to 1, or by dividing by the square root of the sum of their squares.

Source: Scott Weiss Search Engine Glossary and Glossary of Information Retrieval. Glossary of Information Retrieval at URL: http://www.cs.jhu.edu/~wise/glossary.html and Search Engine Glossary at URL: http://searchenginewatch.com/facts/glossary.html

CHAPTER 1

1 INTRODUCTION

The technology that facilitates time-sharing and collaboration was founded with the goal of building a national computer network for all citizens. One of the first projects that came out of the Advanced Research Project Agency's, ARPA, technological advancement was the invention of the digital computer to link four universities across the country (Smith, Gibbs, &McFedries 1995). To support the research and intellectual need of students and faculty, 45 academic institutions within New Jersey are collaborating to respond to by allowing access to scholarly information from home, office, or dorm. The traditional library structure is becoming obsolete because information technology has extended the lines of communication to operate across distances as a digital library. Digital libraries are in existence all over the world and serve almost every area of public interest and scholarship.

A digital library model can be effective, efficient, and satisfactory for students and faculty if the development systematically employs three phases of effort: analysis, design, and implementation (Horton 1994). Progressive phases of implementation of the digital library model can ultimately enhance success. Development is a process not an event. It is "iterative, cumulative, and empirical." Iterative in that several instances of trial will be required, cumulative in that a lesson is learned from each trial, and empirical in that improvements are based on test and experience with the implemented system (Horton 1994).

In a distributed system for nearly 220,000 Full Time Enrollment, FTE, students, a key element for success is the initial and continued focus on the users of the new system.

Continued focus on users is often not the case. If success of the system is the ultimate goal, a key element is analysis directed at identification of users and their tasks. Organizations and users are the prize holders of the systems' success. Organizations in both the public and private sectors participate in developmental projects to enhance their image and the activities of their members through planned interventions. The Virtual Academic Library Environment, VALE, is committed to the academic goals of New Jersey's public and private institutions by providing an information resource system to enhance teaching, learning, and scholarship at both the graduate and undergraduate levels. The ultimate objective is to promote the use of information resource beyond the usual setting--a building with walls and physical artifacts.

The reason for this case study is to determine if there is a collective determination of users for VALE and if there is a common objective for organizational participation. To accomplish this I will examine conventional developmental process and explore the organizational identification of library database search skills of selected population of VALE users--the students--from within the consortia and individual organizational motives of the members.

1.1 Digital Library Background

Vannevar Bush first presented the vision of a prototype electronic library, accessible from anywhere in the country in 1945. He wrote about his vision of a digital library when he stated "instruments are at hand which ...will give man access to and command over the inherited knowledge of the ages. The perfection of these pacific instruments should be the first objective of our scientists as they emerge from their war work"(Fox 1994). Digital library development began in the 1950's and 1960's with the field called

"information retrieval," that was facilitated by digital computers. During the war, scientists worked in large groups and were able to make great strides in scientific research. Bush's vision of a distributed system was born out of scientific progress that came about during World War II. It enabled and allowed scientists to work in teams rather than alone as they had for years before the war. Bush proposed a device called a "Memex" designed to use bar-coded microfilm as its data source (Bush 1945).

Today through the advent of the modern computers, books are designed, saved, and printed or placed in on-line systems for information use by individuals. The primary requirements of a digital library are equipment, data, and electronic access. The International Institute for Electronic Library Research offers this definition of the electronic library:

> An electronic library (known in the US as a 'digital library') is an organized and managed collection of mixed media material in digital form, designed for the benefit of a particular user population, structured to facilitate access to its contents and equipped with aids to navigation of the global information network.

As implied above, determining the most effective digital library development requirements apart from hardware, software, electronic access, and data, physical library establishment, users must be identified and understood. By so doing, this action will reveal whether the digital library will function as library without walls or serve as a useless icon that frustrates and unreasonably challenges users. The following is a list of US Library Servers on the World Wide Web, WWW.

Table 1: Library Servers on the Web

Academic Libraries	**694**
Public Libraries	**367**
National Libraries and Library Organizations	**22**
State Libraries	**43**
Regional Consortia	**48**
Special and School Libraries	**49**
Total Library Servers on the Web	**1,223**

SOURCE: Berkeley Digital Library SunSITE. (1998). [WWW document at URL http://sunsite.Berkeley.EDU/Libweb]

There are 1,223 U.S. Library Servers on the Web and the number is growing daily. In 1994 public agencies, namely the National Science Foundation (NSF), Advanced Research Project Agency (ARPA), and National Aeronautics and Space Administration (NASA) funded six universities to conduct research and development of new technologies for digital libraries. The universities were: Carnegie Mellon University; University of California (UC), Santa Barbara; University of Illinois; University of California, Berkeley; Stanford University; and University of Michigan. Each university project had a different goal but contributed to the unified system of distributed information through interoperability using different approaches. Carnegie Mellon and UC, Santa Barbara projects focused on providing the ability to manipulate new media that were impractical to index and search. The Illinois and Berkeley projects focused on full systems with numerous users. Illinois provided manual structured text documents and Berkeley provided automated recognition of image documents. Michigan and Stanford projects focused on investigating the intermediary gateway needed to perform operations in the large-scale digital library.

All institutions are building test models with large collections to address their research questions. Because the number of servers, academic and other, is growing

universally, there is a need to develop systems that emphasize usability by all. Systems of this genre are operating in states throughout the union today. Currently they exist in Georgia, Virginia, Ohio, Louisiana, and Texas. These states boast consortia composed of primary and secondary educational institutions, public libraries, and others. Table 2 shows the most prominent academic digital libraries in the United States today. They are Galileo, OhioLink, TexShare, VIVA, and the Louisiana Library Network. Galileo is the digital library system of Georgia established in 1995. Galileo began with 34 academic institutions. It has since evolved into a system of 59 institutions throughout Georgia offering a vast variety of databases.

Table 2. Prominent state digital libraries in the US

Existing State Digital Libraries	Start Date	User Communities
Galileo (Georgia)	1995	34 Georgia institutions
VIVA (Virginia)	1994	39 Virginia Institutions
OhioLink (Ohio)	1992	
TexShare (Texas)	1994	52 Texas institutions
LOUIS/LLN (Louisiana Library Network)	1993	5 Louisiana institutions

Within these groups, it is accepted for users to access and search the associated databases from a common interface and get data results within seconds. There is a common interface within each system that does not require re-orientation when information is needed from institutions within the consortia. Search techniques on the Internet and other digital libraries can be deceptive without a clear understanding of how to formulate inquiry to receive meaningful result. Only if the user is an intermediate to expert user, with knowledge on how to formulate and reduce inquiry to keyword and other database queries can search render meaningful results. When users retrieve

information it must be read to determine relevance to their needs. Additional time must be spent to retrieve those items that are relevant. This is particularly true in large digital libraries, and the problem can become acute in digital libraries the size of VALE. One barrier exists in developing a digital library and that is the development of a system without any understanding of who the users are and what their tasks will be within the proposed system.

Information Technology

Two of the most prominent features of the 20th century have been the development and exploitation of information technology. In the past 30 years, the standard for information distribution has changed from paper, to magnetic tape, to CD-ROM. Storage capacity for a workstation has increased from hundreds of megabytes to gigabytes. Information in databases is available in varying individual media and combined media formats resulting in increased data formats available for use.

Almost simultaneous improvements are made to communication technology in the past 20 years. Baud transcription has changed to fiber optic carrying gigabytes per second and packet switching networks using telephone lines that make it possible to match speeds. The vision of ARPA has been realized and now the planet must be wired and connected one step at a time.

Ready or not computers and remote electronic access to information is available to all people. This calls for rapid assimilation with more places providing information thereby creating greater difficulty in searching and finding what is needed.

There are two main functions of libraries; one is technical service, and the other is user service. In the technologically advanced society we live in, the ubiquity of the technology has become more important than the technology of remote access.

1990s Information Technology

The United States has led the world revolution to abolish distance in communication and information retrieval. As the information age evolves and more systems are developed, the era becomes more distinguished by what and how you can retrieve information. Information resource projects are critically tied to development in human-computer interactions. Human computer interaction deals exclusively with systems that acceptably meet the stated usability requirements. Usability requirements to be met include easy to use, easy to learn, easy to remember, contain few errors, and be subjectively pleasing.

Computers are now being used in sophisticated retrieval systems, (such as Galileo and VIVA). Software with a defined set of instructions or procedural steps will lead to a logical conclusion for a specific problem and be used for information handling in the retrieval systems that are networked with remote access options for internet connection. A well-designed and usable digital library system is a necessity for research purposes and higher education today.

Implications for Academe

Building a digital library will have profound impact on education and general state research in New Jersey. Digital library permit students and faculty, throughout New Jersey, to immediately access information relevant to research questions and keep current on technological advances quickly and effortlessly. It will permit New Jersey students

and faculty, to obtain information on a variety of topics, some of which the users do not have access to today. Digital Library aid in the timely evolution of computer systems, telecommunications infrastructure, and software tools to continually improve on technology's evolution. Improvements can also be seen in the overall infrastructure on which a statewide system will operate providing a "leading position in the international information industry"(Fox 1993).

Ideally, we should try to create a library that is suitable for any undergraduate and graduate majors and disciplines at any New Jersey educational institution. This library should include dissertations, abstracts, journals, and citations for all levels of academe. It should store book, audio, and video information; and provide a search system to retrieve- - based on key word and/or subject matter input. Access to this material should be available from on and off campus to students and faculty. Funding is currently the responsibility of the institutions involved, in cooperation with state and federal agencies. This is the best way to use physical artifacts and electronically available resources to improve education for all.

VALE's goal includes the best ideals of the library at each institution, where the larger institution's resources combined with the diversity of all the colleges and universities throughout New Jersey offer a formidable resource advantage for the students and faculty.

The United States is a leader in information technology. This distinction is bestowed to the U.S. not for creating useless systems but for harnessing early basic new technology that is commonly used by everyone. Educational institutions are becoming the leaders in the delivery of library services and information by networks. These library networks are

a positive extension of the institutions involved. They establish an information resource system that serves the needs of academe and does not become solely dependent on cooperative relationships as data sources. The structure of the system will change, however it should be possible, in new technology and old to have leading and self-sufficient digital libraries in New Jersey.

To prepare for the national information infrastructure, we should see to it that all educational facilities, public libraries, and industry are connected to VALE within the next five years.

In a large distributed digital library system like VALE, the user is responsible for performing some manual navigation within a network, retrieving and reading documents that contain the relevant information. As the size of the system increases the users must try more techniques to find what they are looking for (Pinkerton 1994). Search techniques available in a digital library fall into two main categories: subject matter and keyword searching. In a subject matter search the user must know the meaning of very broad terms, and be able to judge where the information they need falls under those terms. Keyword searching on the other hand requires that the user enter a word or combination of words and phrases. This includes combinations of terms to locate text containing the specified terms. Additionally, keyword searching commonly makes use of a pre-compiled index that contains an entry for "each word that has pointers to all documents containing that word" (Beck, Mobini, and Kadambari 94). According to Cromwell-Kessler, providing and ensuring access to stable repositories of standardized information is a pressing issue that presents challenges to information management made available by the Internet environment. Providing access to digital content through Web

based standardized interface will draw upon varying components of functionality. In addition, they will allow near seamless integration of diverse database as well as a wealth of remote resources. An important component of such a system is the ability to navigate among different resources. Accessing a library citation database through the Web is not done in the same way as accessing static HTML Web page (Cromwell-Kessler 1997).

The evolution in academic libraries is expanding to take advantage of rapid developments in computers, telecommunications, and other technologies. It is these rapid technological developments that make it possible to store and retrieve information in many different forms, from any place, and at anytime with a computer and telephone connection. Students of 43 institutions are ascribed as the primary beneficiary of this evolution.

Online Computer Library Center Mission

Online Computer Library Center (OCLC) provides the interface for VALE. Their mission is to expand knowledge by improving access to the world's information resources in a variety of formats, substances, subjects, languages, or locations. OCLC pursues their mission through the employment of computer, library, and information services (OCLC 1997).

Because of technology, library information is in electronic format and users need to access the information. The issues then become usability and access to material. VALE is changing the circumstances of the users. Users are developing electronic habits increasingly, but most are still novices at searching library databases. Most students are still being transitionalized from card catalogs stored in the libraries to electronic storage of information coupled and complicated by telecommunications technology. The new

tools are indeed powerful but could prove useless if the users do not find them effective, efficient, and satisfactory.

Librarians agree that most people have very little skill in efficiently and promptly finding the information they want. Their clients make statements like "I don't have time to look on the Internet; it takes too long." So how does a consortium of 43 libraries plan to serve nearly 220,000 students as well as their faculty and administrators? By forming clear objectives as the foundation of its design, grounded in institutional identification of the user's success of the system at implementation and after can be assured. The knowledge, background, interest, and needs of the users will vary from novices who need careful and structured introduction, to experts who may be irritated at functions that seems to patronize or delay their access to information. A well-designed system is described as one that is able to accommodate range of skill users. Therefore, if the goal is to provide needed information that used to be on paper, the system must meet the established average user requirements.

Lynch classifies novices and occasional users as those that depend on clear structure and easy access to full text that meet their search needs. They are intimidated by complex text menus and may be tentative about using the system if it is not clear. Expert and frequent users depend on being able to obtain information quickly. They can be very impatient because they have very specific goals in mind and appreciate anything that allows fast search and retrieval.

The two classes of the user spectrum fall at varying degrees when it comes to the interface design, suggesting a clear initial identification of VALE user. By identifying the users of VALE, usability can be guaranteed.

Traditionally, digital means the use of numbers (0s and 1s of digital data) and is a term that comes from digit, or finger. Today, digital is synonymous with computer. The term has been expanded to be incorporated in defining information turned into binary digital form. That information can then be electronically manipulated preserved and regenerated perfectly at high speed. The library on the other hand is defined as a collection of or repository for literary and artistic materials, such as books, periodicals, newspapers, and prints kept for reading and reference (Houghton Mifflin 1980). Lyman sees the attaching of the adjective "digital to the noun "library" as adjustment of the past with the future (Graubard & LeClerc, 1998). To broaden the definition, I extract from the denotations to describe a digital library as a distributed computer system equipped with a collection stored in digital format that can be electronically retrieved by a user. A digital library requires computer hardware and software as well as electronic access technology to exist. It is therefore the progeny of information technology.

The digital library combines characteristics of libraries, electronic information retrieval and computer systems that support work to create new and interesting problems of design and evaluation. This study is intended to look at the framework of VALE, the digital library, its ascribed user, and the organizations it is designed to serve. Is the system designed to suit the user, the organizations, or both?

Constructing a physical building for a library collection is a familiar idea. Most people will agree that the library is more than a physical space that contains books. Quite a bit of planning goes into the opening of a library: you must acquire a collection, index, and store it for easy retrieval. Building a high quality digital library is not much different or is it? Consider the roles of the players in both the traditional and the digital library.

Traditionally engineers ensure the building as a physical structure satisfies a functional perspective. For example, after selecting a location, it must be surveyed, and sufficient access to vital services ensured, such as water and utilities. Land must be drilled and tested to assure support of the structure's weight. Other vital questions must be answered such as adequate space for the planned collection and future acquisitions.

For a digital library the engineer must assess and choose from a variety of connectivity options, server types, server software, and telecommunication provisions. The digital library engineer also makes sure the various ideas and functions of the members of the team can work. In other words, since a searchable inventory will be a vital part of the digital library plan, the engineer must determine the right database technology. The engineer must also assure the processes are in place so that the data can move from within the organization to the database and from there (by way of Common Gateway Interface scripts) to the server accessed by the user.

The architect designs the physical building that will house the various media collections once the engineer has established the site. The architect creates the blueprints that integrate both aesthetic and functional needs. For example, it may be functional to locate book return bins and restroom facilities in the front of the building. However, a good architect will also consider the effects that such a location may have on the users and may compromise by locating them elsewhere. The architect is therefore responsible for guaranteeing that the user finds their way around the library easily. Particularly that users find the services (for example the information and reference desk, the rest rooms the fire signs) they need to be a more pleasant rather than unpleasant experience.

For a digital library, the architect also creates a blueprint. In this case, the blueprint

shows how the various documents in the collection are linked (thereby establishing ways for the user to navigate the host) and how documents and groups of documents are labeled and organized, as a librarian would do. The blueprint would also show what functions would be available in the site (a searchable inventory, an ordering interface and a comment interface) and where those functions will be available. In creating this blueprint, the architect provides context for other members of the design team: the engineer knows what functions need implementing in the site, and the designer has a framework "workable space" to embellish aesthetically (Rosenfeld & Morville 1998).

The interior designer responsibility goes beyond that of wall color selection. The designer is responsible for how books are arranged on the shelves; which options the patron should see when they first walk in; what goes on the display boards, and what types of signs will be used--all of these are major collection decisions that the designer must consider. The library's exterior appearance has to appeal to patrons, so a landscape architect might also be required.

The digital library designer fleshes out the architect's blueprints to make sure the library will have an appropriate and attractive look and feel. Quality graphics can be used to define the library's image, and consistent graphics will carry that theme throughout the site. However, more than graphics is involved: the quality and consistency of the text should not be under estimated in the creation of the virtual site. Therefore, an experienced technical writer should be an integral part of the design team.

1.2 VALE Background Information

The Virtual Academic Library Environment, VALE, is a consortium of New Jersey's college and universities (Table 3). Vale serves nearly 220,00 FTE students at 45

institutions and currently offers access to scholarly material from four select databases. Cost to each institution is assessed based on each institutions' selected level of participation in different aspects of the project. Academic databases are licensed according to the user population, as indicated by the full time enrollment, FTE, at each institution and their participation in different aspects of the project.

VALE offers user initiated network search capability, retrieval and reading, or printing of documents that contain relevant information. Users can electronically request documents (mostly articles) indexed within the database catalog. The aggregate contents of the system are records from the four commercially available databases encompassing material from disciplines including humanities, business, and the physical sciences.

VALE is designed to serves students, faculty, and staff of member institutions through their campus library systems, campus networks, and the Internet. The system provides access based on simultaneous users at nearly 50 locations. Access to the VALE databases is not yet available to outside users and is currently restricted to member users (valid members at VALE member institutions). VALE memberships include 3 public universities, 10 state colleges, 20 community/county colleges, and 12 private collages in New Jersey.

Vale is a consortium of academic libraries primarily funded through the New Jersey Higher Education Commission. The project grew out of a 1996 recommendation by the NJ Academic Library Advisory Board that the state of New Jersey implement an "inter-institutional information connectivity and collaborative library application project among its members"(http://www.wilpaterson.edu/~vale/valenew.html#statement).

Table 3(A): VALE participants

			DATABASES													
INSTITUTIONAL	FTE's/Users		UMI's Research II		PsycInfo		UMI's ABI/Inform		CINAHL		Workstation	Server	TOTAL	
Participants	#	%	$0.35/FTE	%	$0.766/FTE	%	$0.45/FTE	%	$0.14/FTE	%	Allocation	Costs	COST	%
Atlantic Community College	3,303	1.5%	$ 1,156	2%	$ -	0.0%	$ 1,486.35	1.7%	$ 462.42	1.9%	$ 2,430	$ 2,256	$ 7,791	2%
Bergen Community College	7,489	3.4%	$ -	0%	$ 5,739.57	6.6%	$ 3,370.05	4.0%	$ 1,048.46	4.3%	$ 2,430	$ 5,115	$ 17,703	4%
Berkeley College *	**1,500**	**0.7%**	**$ -**	**0%**	**$ -**	**0.0%**	**$ 1,350.00**	**1.6%**	**$ -**	**0.0%**	**$ -**	**$ 2,049**	$ 3,399	1%
Bloomfield College	2,053	0.9%	$ 719	1%	$ -	0.0%	$ 923.85	1.1%	$ 287.42	1.2%	$ 2,430	$ 1,402	$ 5,762	1%
Brookdale Community College	7,260	3.3%	$ 2,541	4%	$ -	0.0%	$ 3,267.00	3.8%	$ 1,016.40	4.2%	$ 2,430	$ 4,959	$ 14,213	3%
Burlington County College	3,516	1.6%	$ -	0%	$ 2,694.66	3.1%	$ 1,582.20	1.9%	$ 492.24	2.0%	$ -	$ 2,401	$ 7,171	1%
Caldwell College	1,104	0.5%	$ 386	1%	$ -	0.0%	$ 496.80	0.6%	$ 154.56	0.6%	$ 2,430	$ 754	$ 4,222	1%
Camden County College	7,741	3.5%	$ 2,709	5%	$ -	0.0%	$ -	0.0%	$ 1,083.74	4.5%	$ 2,430	$ 5,287	$ 11,510	2%
Centenary College	643	0.3%	$ 225	0%	$ 492.80	0.6%	$ 289.35	0.3%	$ 90.02	0.4%	$ 2,430	$ 439	$ 3,966	1%
College of St. Elizabeth	925	0.4%	$ 324	1%	$ 708.92	0.8%	$ 416.25	0.5%	$ 129.50	0.5%	$ 2,430	$ 632	$ 4,640	1%
County College of Morris	5,618	2.6%	$ -	0%	$ 4,305.64	5.0%	$ 2,528.10	3.0%	$ 786.52	3.2%	$ 2,430	$ 3,837	$ 13,887	3%
Cumberland County College	1,583	0.7%	$ 554	1%	$ -	0.0%	$ -	0.0%	$ 221.62	0.9%	$ 2,430	$ 1,081	$ 4,287	1%
DeVry Institute*	***2,753***	**1.3%**	***$ 1,927.00****	***3%***	***$ 4,219.80***	**4.9%**	**$ -**	**0.0%**	**$ -**	**0.0%**	**$ -**	**$ 3,761**	**$ 9,908**	2%
Drew University	1,930	0.9%	$ -	0%	$ -	0.0%	$ -	0.0%	$ -	0.0%	$ 2,430	$ -	$ 2,430	0%
Essex County College	6,160	2.8%	$ 2,156	4%	$ -	0.0%	$ 2,772.00	3.3%	$ 862.40	3.6%	$ 2,430	$ 4,207	$ 12,428	2%
Fairleigh Dickenson University	5,623	2.6%	$ 1,968	3%	$ 4,309.47	5.0%	$ 2,530.35	3.0%	$ 787.22	3.2%	$ 2,430	$ 3,841	$ 15,866	3%
Georgian Court College	1,547	0.7%	$ 541	1%	$ 1,185.62	1.4%	$ 696.15	0.8%	$ 216.58	0.9%	$ 2,430	$ 1,057	$ 6,126	1%
Gloucester County College	3,032	1.4%	$ 1,061	2%	$ -	0.0%	$ 1,364.40	1.6%	$ 424.48	1.7%	$ 2,430	$ 2,071	$ 7,351	1%
Hudson Community College	3,094	1.4%	$ 1,083	2%	$ 2,371.24	2.7%	$ 1,392.30	1.6%	$ 433.16	1.8%	$ 2,430	$ 2,113	$ 9,823	2%
Jersey City State	5,449	2.5%	$ 1,907	3%	$ 4,176.11	4.8%	$ 2,452.05	2.9%	$ 762.86	3.1%	$ 2,430	$ 3,722	$ 15,450	3%
Kean University	8,411	3.8%	$ 2,944	5%	$ 6,446.19	7.5%	$ 3,784.95	4.4%	$ 1,177.54	4.8%	$ 2,430	$ 5,745	$ 22,527	5%
Mercer County Community College	4,448	2.0%	$ 1,557	3%	$ 3,408.95	3.9%	$ 2,001.60	2.3%	$ 622.72	2.6%	$ 2,430	$ 3,038	$ 13,058	3%
Middlesex County College	6,667	3.0%	$ -	0%	$ -	0.0%	$ -	0.0%	$ 933.38	3.8%	$ 2,430	$ 4,554	$ 7,917	2%

** Berkeley College and Devry Institute(as For Profit Institutions) are ineligible for Bond Funds, but are participating by paying 100% of their share costs.*

Table 3(B): VALE participants (*continued*)

			DATABASES													
INSTITUTIONAL Participants	FTE's/Users #	%	UMI's Research II $0.35/FTE	%	PsycInfo $0.766/FTE	%	UMI's ABI/Inform $0.45/FTE	%	CINAHL $0.14/FTE	%	Workstation Allocation	Server Costs	TOTAL COST	%
Monmouth University	3,966	1.8%	$ 1,388	2%	$ 3,039.54	3.5%	$ -	0.0%	$ 555.24	2.3%	$ 2,430	$ 2,709	$ 10,122	2%
Montclair State University	9,296	4.2%	$ 3,254	5%	$ 7,124.45	8.2%	$ 4,183.20	4.9%	$ -	0.0%	$ 2,430	$ 6,349	$ 23,340	5%
NJIT	5,578	2.5%	$ 1,952	3%	$ -	0.0%	$ 2,510.10	2.9%	$ -	0.0%	$ -	$ 3,810	$ 8,272	2%
Passaic County College	2,056	0.9%	$ -	0%	$ 1,575.72	1.8%	$ 925.20	1.1%	$ 287.84	1.2%	$ 2,430	$ 1,404	$ 6,623	1%
Princeton University	6,312	2.9%	$ -	0%	$ -	0.0%	$ 2,840.40	3.3%	$ -	0.0%	$ -	$ 4,311	$ 7,151	1%
Ramapo College	3,323	1.5%	$ -	0%	$ 2,546.75	2.9%	$ 1,495.35	1.8%	$ 465.22	1.9%	$ 2,430	$ 2,270	$ 9,207	2%
Raritan Valley Community College	3,003	1.4%	$ -	0%	$ -	0.0%	$ 1,351.35	1.6%	$ 420.42	1.7%	$ 2,430	$ 2,051	$ 6,253	1%
Rider University	3,752	1.7%	$ -	0%	$ 2,875.53	3.3%	$ 1,688.40	2.0%	$ -	0.0%	$ 2,430	$ 2,563	$ 9,557	2%
Rowan University	7,004	3.2%	$ 2,451	4%	$ 5,367.87	6.2%	$ 3,151.80	3.7%	$ 980.56	4.0%	$ 2,430	$ 4,784	$ 19,165	4%
Rutgers University	38,300	17.4%	$ 13,405	23%	$ -	0.0%	$ 17,235.00	20.2%	$ 5,362.00	22.1%	$ -	$ 26,159	$ 62,161	12%
Salem Community College	724	0.3%	$ 253	0.4%	$ -	0.0%	$ 325.80	0.4%	$ 101.36	0.4%	$ 2,430	$ 494	$ 3,605	1%
Seton Hall University	7,004	3.2%	$ -	0%	$ 5,367.87	6.2%	$ -	0.0%	$ -	0.0%	$ 2,430	$ 4,784	$ 12,582	3%
St. Peter's College	2,945	1.3%	$ 1,031	2%	$ 2,257.05	2.6%	$ 1,325.25	1.6%	$ 412.30	1.7%	$ 2,430	$ 2,011	$ 9,467	2%
Stevens Institute	2,179	1.0%	$ 763	1%	$ 1,669.99	1.9%	$ 980.55	1.2%	$ -	0.0%	$ 2,430	$ 1,488	$ 7,331	1%
Stockton State College	5,160	2.4%	$ 1,806	3%	$ 3,954.62	4.6%	$ 2,322.00	2.7%	$ 722.40	3.0%	$ 2,430	$ 3,524	$ 14,759	3%
Sussex County Community College	1,303	0.6%	$ 456	1%	$ -	0.0%	$ 586.35	0.7%	$ 182.42	0.8%	$ 2,430	$ 890	$ 4,545	1%
The College of New Jersey	5,707	2.6%	$ 1,997	3%	$ -	0.0%	$ 2,568.15	3.0%	$ -	0.0%	$ 2,430	$ 3,898	$ 10,893	2%
Thomas Edison College	2,861	1.3%	$ 1,001	2%	$ 2,192.67	2.5%	$ 1,287.45	1.5%	$ 400.54	1.6%	$ 2,430	$ 1,954	$ 9,266	2%
UMDNJ	3,667	1.7%	$ 1,283	2%	$ 2,810.39	3.2%	$ 1,650.15	1.9%	$ 513.38	2.1%	$ -	$ 2,505	$ 8,762	2%
Union County College	6,140	2.8%	$ 2,149	4%	$ -	0.0%	$ 2,763.00	3.2%	$ 859.60	3.5%	$ 2,430	$ 4,194	$ 12,395	2%
Warren County Community College	514	0.2%	$ 180	0%	$ 393.93	0.5%	$ 231.30	0.3%	$ 71.96	0.3%	$ 2,430	$ 351	$ 3,658	1%
William Paterson University	6,866	3.1%	$ 2,403	4%	$ 5,262.10	6.1%	$ 3,089.70	3.6%	$ 961.24	4.0%	$ 2,430	$ 4,689	$ 18,836	4%
TOTAL	219,509	100%	$ 59,532	100%	$ 86,497	100%	$ 85,214.25	100%	$ 24,289.72	100%	$ 92,340	$ 151,512	$ 499,385	100%

OCLC/VALE History

OCLC began at the Ohio State University (OSU) and grew from a regional computer system for 54 Ohio colleges into an international network. As it expanded through the years its name was changed to OCLC, Online Computer Library Center, Inc. Today it serves more than 30,000 libraries of all types in the United States and 65 other countries and territories. Many organizations are turning to OCLC to provide libraries, researchers, and others with comprehensive reference tools. Their products include a wide range of index citations, journals, essays, book reviews, and projects from print indexes.

First Search, a service of OCLC, is a database with full text of online resources with a common interface. Libraries that use FirstSearch can search across journals from many different publishers, using a single interface and access point. A user can search and retrieve a list of article citations, with links to abstracts and journal articles for the on-line journals of the database(s) to which the institution subscribes. The users can also select from the browser tabs the basic or advanced search screens to view a list of journal titles. For each title, the user can view a list of available issues, the table of contents for the selected title, and link to abstracts and full text articles within the database(s) the institution subscribes to. FirstSearch provides features that enhance the electronic collection on-line database by integrating the databases into the on-line and physical serial collections of the library.

Vale contracted with OCLC to provide SiteSearch, a defined and marketed product as the backbone search engine for selected databases. Since the implementation of SiteSearch would take many months, VALE will link to OCLC and their FirstSearch Online databases as an interim step. VALE contracted, through OCLC, with three

electronic database publishers for four databases that are loaded into SiteSearch on the VALE Host at Rutgers University. VALE is limited to the design of the SiteSearch and FirstSearch engines and to the commercial database design.

The OCLC SiteSearch software provides comprehensive solution for managing distributed library information resources in an Internet environment. It offers tools that integrate electronic resources using one common interface, control access to resources, build text and image databases locally. SiteSearch components include WebZ, Database Builder, and Imaging Support Package (http://www.oclc.org/oclc/sitesearch/servover/10217_2.htm). Sitesearch offers several benefits to users including the following functions in the WebZ interface:

- Quick and topic search by title or author
- Keyword searching through a virtual catalog search
- Browse term and history search list

The Quick Search option allows your user to search multiple databases in a single search. Topic searching allows the user to select relevant databases and create a topic area for use through out the search session. Through Virtual Catalog Search, users have integrated access to multiple catalogs through a single interface. The Browse Term List option offers the user the ability to browse the terms in any index and select terms for searching. Search History offers the user the ability to track and view results from previous searches. Results Screen presents the results of searches in a flexible manner, allowing the user to jump between the record display and the result grouping.

Using the OCLC SiteSearch suite to create the integrated digital library, the VALE user access to databases is modeled in Figure 1. The model portrays the user access to

collections from WebZ on a local or remote workstation to a variety of local and remote database in full text and image as contract allows.

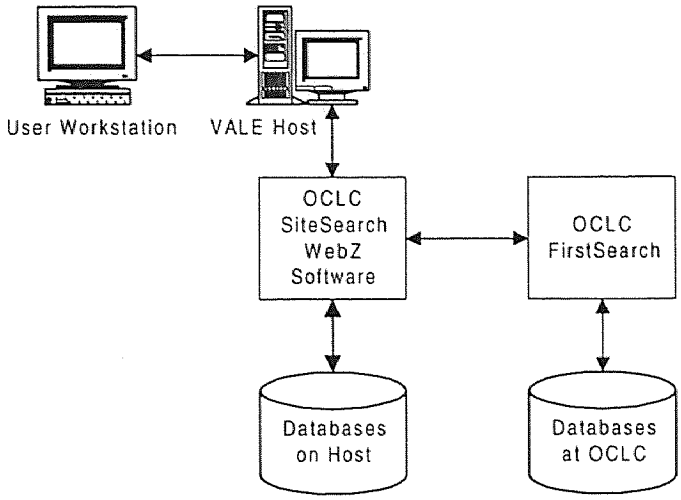

Figure1: VALE User Access Model

CHAPTER 2

2 HUMAN COMPUTER INTERACTION AND DIGITAL LIBRARY

Users of computers and digital libraries come from all lifestyles. Users are culturally diverse because they come from an international community. If a user is in Kalamazoo, Michigan or Newark, New Jersey, international diversity is not lessened by any means. Users consist of the physically challenged, the young and the elderly. Keeping human factors in mind, the goal of the user interface is to ensure that adequate functionality is addressed within applicable budgetary constraints. Shneiderman cites careful determination of the user community and a set of benchmark tasks as the basis for the establishment of human factor goals (Shneiderman 1998). Realizing that historically, programmers designed applications for other programmers or other technically oriented users; in the past it was acceptable for the interface to be complex. Today computer users are ordinary people. Most of these ordinary people have little if any programming experience or background but are task oriented on a discretionary basis. "Current users are not dedicated to the technology, their background is more work-flow, and their use of computers may be discretionary" (Shneiderman 1998). Keeping the non-technical background of an ordinary user in mind, it becomes prudent to establish support for usability studies at the organizational level as early as possible. If user oriented projects are to succeed, the project must incorporate a design that serves users faithfully. Shneiderman states that design is characterized by the following:

- A process, not a state, and cannot be adequately represented statistically.
- A nonhierarchical format--neither strictly bottom-up or top down.

- A radically transformational state wherein it involves the development of partial and interim solutions that may ultimately play no role in the final design.
- An intrinsic condition that involves the discovery of new goals.

These characteristics of design sum up the complex nature of the design process, yet, within complex things, such as the interface, there can be simplicity that can finally yield success.

Who are the users?

In determining the audience of a publication, paper or electronic, the project team must never lose understanding of the purpose and users of the system. The identified digital library system users are the most important consideration of the system over and above technical aspects of implementation. Digital text is formulated within an information technology forum with the diversity of end users that now conduct search tasks within a remote environment.

Students familiar with using traditional printed material know how to perform tasks within a traditional environment; therefore if the remote system does not simulate user task, the system will hold no advantage for them. Students require access to primary source material from the system, but at the same time require that the material is easy to use.

The Purpose of the Interface

Since VALE is a type of interactive system, the results from the areas of human–computer and computer-human interaction to improve these systems and their performance can be applied. Some key issues in this regard include relating the user

environments to the information objects. The interface is a software tool designed to assist users in searching or browsing. The searching capabilities should offer flexibility, "go back" options, purpose switching, and acknowledge human limits. Flexibility exists if the user can search narrowly or broadly, via each request they execute. The "Go back" option allows returning to and retrying if results are not meaningful. Purpose switching enables the user to change the intent of the search. If the interface acknowledges human limits it, allows hundreds of hits but also provides filters to narrow search criteria (Weinschenk, Jamar, and Yeo 1997).

2.1 Usability Concerns

User aspects and usability are active research areas. Most research efforts can be classified into two categories depending on the inherent goals and objectives of the organization. The ultimate goal and objective of VALE and each member institution is system acceptability. In order for this goal to be achieved, social and practical acceptability must be incorporated. Practical acceptability as indicated in Figure 2 is an adapted model of system acceptability.

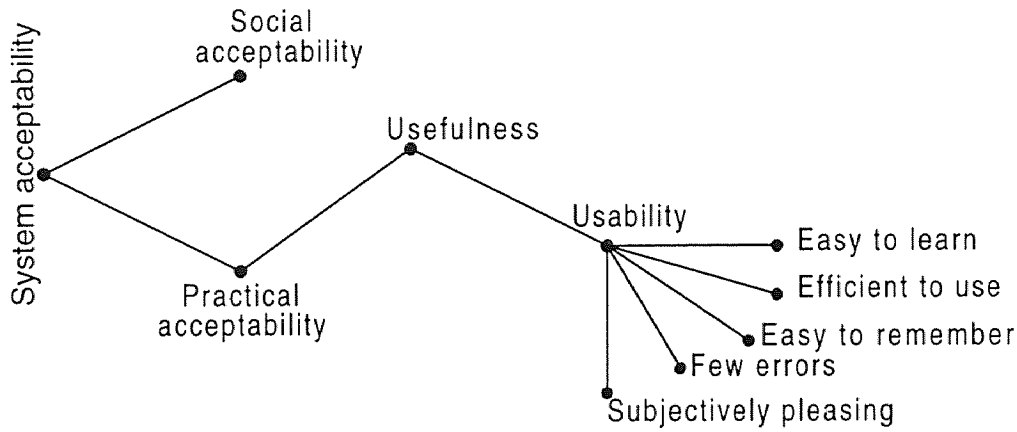

Figure 2. An adapted model of Jakob Nielsen's attributes of system acceptability.

The model in Figure 2 shows that practical acceptability is grounded in usefulness. Usefulness is achieved through usability criteria of any system to be acceptable, it must meet several specific components and that usability has some trade off that must be considered in project development.

User Aspects

The success of VALE requires a better than perceptual identification of the average VALE users be made and incorporated in the design and implementation phases of the project. This activity would begin by identifying the average user within member institutions. The first step of implementing this new system is to look at the users within each institution. For example, the digital library projects being implemented in four types of institutions include colleges and universities that fall into one of these categories: State, Independent, Community, and Research.

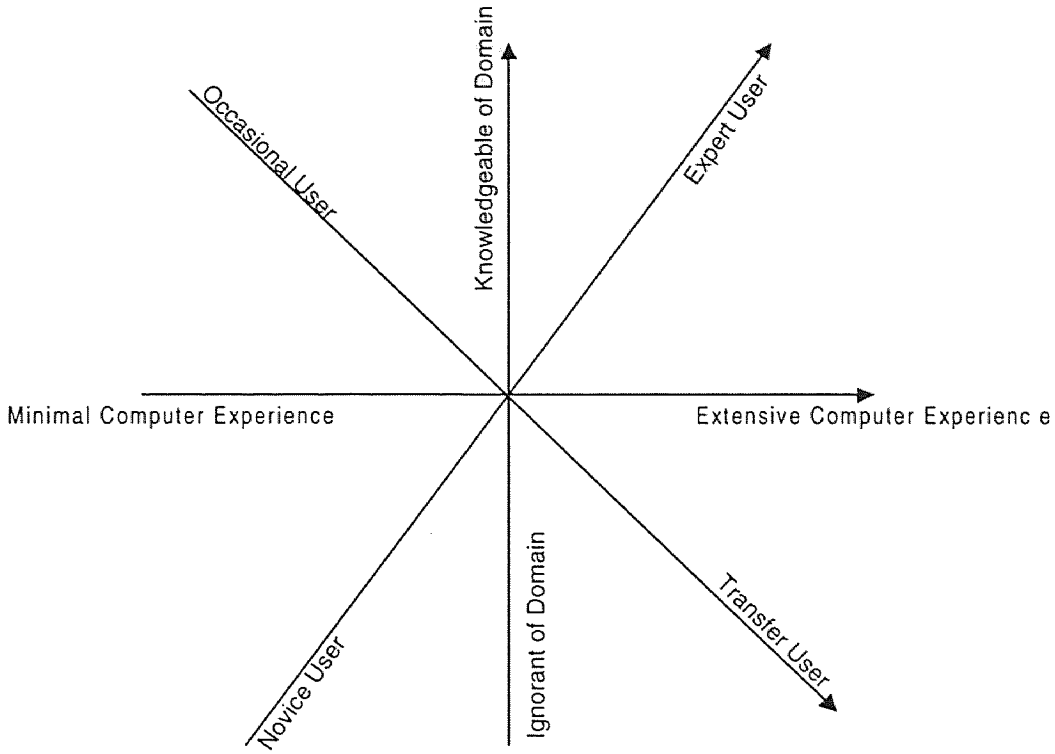

Figure 3. The four dimensions of user experiences.

User Categories

A new system is unlikely to have initial expert users. Most have a variety of users whose character changes with use of the system. To understand the characteristics of each, I have placed users in four groups based on computer knowledge and knowledge of the domain in Figure 3. The Novice user has minimal computer experience and is ignorant of the domain. The Occasional user has minimal computer experience but is knowledgeable of the domain. The Transfer user has extensive computer experience but is ignorant of the domain. The Expert user has extensive computer experience and is knowledgeable of the domain (Horton 1994 & Nielsen 1993).

In building a large-scale user environment, it becomes important to focus initially and continually on the proposed users of the system. Building VALE can only be meaningful if the users find it useful.

Usability Experts and Usability

Usability experts come from a wide variety of educational backgrounds, which includes: technical communications, computer science, information science, developmental psychology human factors psychology, social psychology, and industrial engineering.

Usability concerns related to computer products began in the 1980's when non-technical people users'. Their objective is centered around bring user-feedback into the design of computer products throughout the development process. Because of the information, they provide products began to exhibit appropriate and effective user-centered design qualities.

Usability Testing

Usability testing refers to observational research done in a controlled environment. The actions of real users are recorded and analyzed as they try to accomplish real-life tasks with products. The project or product team members such as usability experts and user-interface designers then translate this information into product design. Observational research testing is usually done on a one-on-one basis, where different methodologies are employed to address the scope of design questions that are necessary. Testing is conducted in test environment specifically created for this purpose where space is designed for observation and data collection. The test subjects are recruited from the

proposed user environment where the product is generally in development, and tests the synergy of system components (hardware and software) using subjects from all levels of computer experience ranging from novice to experts is tested.

2.2 Linda Flower Theory of the Construction of Negotiated Meaning

Despite the many expanded and experimentally consistent approaches to communication theory developed to follow those constructed by Shannon and Weaver, Linda Flower's adaptation is the most applicable to this research. Flower's approach employs a formulation of how humans construct meaning in an era of visual representation.

The extractions from Flower's paradigm in Figure 4 shows that discourse construction is grounded in the classification of reading as a literate act. In the model, readers construct meaning within a framework established by social and cultural context, language, and discourse conventions. These conventions form an influence represented by an outer circle, in conjunction with purpose, specific goals, and activated knowledge that are linked to a task to be accomplished. The readers build a socially shaped and individually formed meaning from what they see.

Flower further suggests that there is a link between personal and, or public contexts for construction. Text/interface cannot be understood until the internal representations' people build is understood. This is the means by which personal cognitive constructs mediate the context and conventions that could theoretically shape system usability. The context and conventions account for critical differences in the manner individuals interpret shared social expectations, the way tasks are interpreted, the conventions of a new discourse, or user response. Flower interpreted web of meaning constructs as a mental representation.

The representation tells a more complicated story than the representation found in text, because they also "include the presence of forces in conflict and roads not taken."

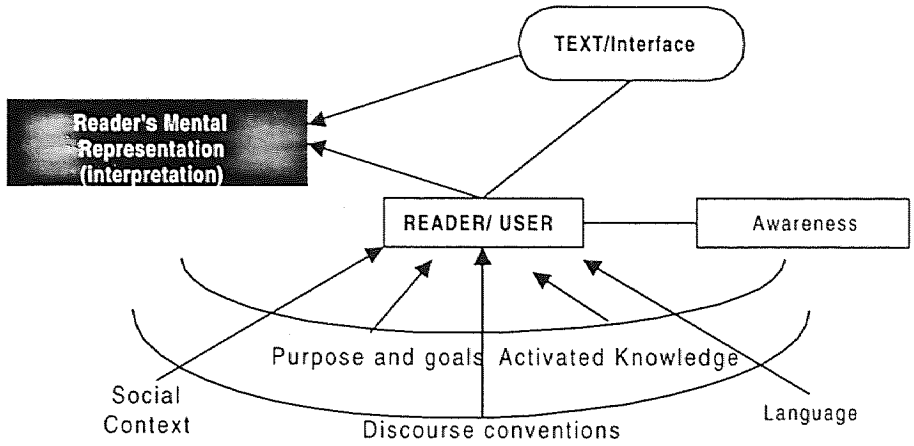

Figure 4: Adapted from Discourse Convention Model in Constructing Negotiated Meaning

In the discourse convention model, awareness is a relative feature because meaning makers may only be vaguely aware of their constructive process and the forces within and on which it operates. Notwithstanding the adaptations of communication or information theory extant today--and those likely to be formulated tomorrow--the construction of meaning through discourse convention is the most applicable theory to support my assessment of state digital libraries. Usability of a digital library has an implied discourse convention between organizational designers and users. The user of the VALE system must create a mental representation or interpretation of its social and cultural context, and language of discourse conventions established by the organizational designers. Discourse conventions include but also go beyond formal text features or sections of topics. They include conventions about what search options matter, what word to use to frame what can be done, and services available. If interface serves its

audience well, users can get what they want quickly and effectively. For a site to be usable, it's should display words or text that apply to knowledge of the users. This may include words that signal real understanding of who users are. The user must not be required to travel to another dimension extemporaneously.

In VALE, organizational designers and users construct meaning as they do with readers. A partnership must exist where, the organizational designers as they set the foundation for the usability of this resource. When a user looks at the digital library options screen, what is his/her central unit of analysis? The landscape on the screen, the discourse, and the text within the frames forms meaning to the user. To account for the meaning to the user, the literate act of the language dictates a partnership. First communication theory as with knowledge theory requires rigorous but straightforward languages to permit translation into clear symbols that can be executed and used to form productivity in information retrieval tasks. The digital libraries provide an ideal system for this need. Situation and inference drawn from shared meaning according to universal rules may be easily tested. They may be tested in a consistent, socially shaped manner, as long as users are communicating through a shared rational premise of a digital library.

This mode of communication draws its frame of discourse from logic. It is translated into a manner of meaningful interactions between people and further transferred to an equally rational application technical communication. As a strategic transaction is created by organizational designers' awareness of users and users' awareness of designers, a formula for solving certain awareness of the digital puzzle, shall emerge. This progression will prove useful for handling classes of communications that arise out of structured rational design.

The basic theorem of the original communication theory rests, first, upon the assumption that the message transmitted is organized, consistent, and is characterized by relatively low and determinable degrees of wordiness. Under these circumstances, it becomes necessary to develop proper coding procedures for the user, or by placing signs within designated spaces based on usability standards that are understandable. Usability standards that are understandable relates to what the user wants to accomplish from an information source or search routine and should never occur without the consideration of how expertly the signs are coded. Once universal meaning is determined through usability tests and the coding, apply information involved, precise technical communication models of digital library information transactions can evolve into complex analyses within the design structures. They must take into account precise levels of wordiness as well as other known variables.

The wide range user requirement and the complexity of the coding procedures that handle the information limit the usefulness of the theory presented above. At present such procedures, while they theoretically offer broad prospects, are restricted by non-standard encoding procedures that depend upon the capacities of the architecture by which the digital libraries are stored. Although such architecture can handle the logic of vast amounts of relatively simple information, they cannot match the flexibility and complexity of the human centered usability. Human centered usability is a primary instrument for managing the subtleties of most technical communication requirements. Communication theory will intrinsically form the theoretical framework of this research

because it sets the premise for using a distributed system as an interactive social and cognitive process.

Therefore, we can say that the constructs of social construction are implied discourse conventions such as:

A. Formal text features

B. Sections of topics

C. Search option elements

D. Word used to frame

E. Text that apply to user knowledge.

2.3 Organizational Theory

Organizational theory is based on change and the implementation of the change. Organizational development explains the dynamics through which organizational improvement and change supports the fact that the system should benefit the organization but ultimately the user. VALE in providing a distributed system through a consortium is bringing about organizational development of its members.

Harris and DeSimone define organizational development as a process that enhances the effectiveness of the organization and the well being of its members through planned interventions. Three points are associated with this definition. They are the enhancement of the organization's effectiveness, the growth of the members and planned intervention (Harris & DeSimone 1994). VALE's goal of providing a seamless network of information resources that is accessible throughout the state by its members, is one beyond which any individual institution can provide on its own. This constraint is

attributable to decreasing library budgets and increased cost of material. By effectively achieving this goal, the organizational members' goals are also achieved.

The growth of the organization refers to the increase in resource information available through the library because of VALE participation. Ultimately the users realize the benefits particularly when access to the library databases done from their dorms, homes, or offices. This can serve and satisfy not only the organization but the users' communities as well.

Planned intervention is a primary means by which organizational change takes place. It is directed at the organizational rather than the individual level. VALE employs planned intervention by a standardized interface across all 45 campuses. By engaging in planned intervention, the VALE enhances its goal of organizational improvements. The task of broadening and enhancing the amount of information resources it provides for less dollars is an achievement when individual libraries are trying to keep pace with increasing cost of library material. The users are satisfied for example, if on any day they can turn on their computers at home, in the office or the dorms and access the library databases to search and retrieve needed informational resources.

Consequently, we can say that the organizational theory constructs to be applied in this thesis are enhancements of organization effectiveness, growth of the members and planned intervention.

2.4 Organizational Behavior

Organizational behavior is grounded in change process and implementation theory. Lewin represent the change process theory as an advancement of two forces: internal and

external. Internal forces are those which come from within a part of or a role in something and the external forces are those that come from the surroundings. In the case of VALE, the individual organizations are internal forces by their role in the project. They are the "change agents." Change agents motivate the users to modify their old habits. In this case, behavior modification is directed at getting users to think of the library as a place beyond four walls, accessible from anywhere. A place no longer defined only by a location and physical objects, but by the ability to access its collection from beyond the confines of its walls. Time and place are becoming infinite and the member institutions are the agent being contracted with somewhat blinded awareness of user concerns. The most engaging circumstance for members is to create the motivation and readiness to change. Accordingly, organizational theory helps support the overall actions of VALE and its member organizations.

CHAPTER 3

3 RESEARCH METHODOLOGY

The study was designed to examine, through informational interview practices, the user aspects, and organizational aspects of the VALE project. McDowell cites the process importance for the following reasons:

1. Informational interviews are a "transactional process" where both the interviewer and the interviewee communicate their attitudes and values through verbal and nonverbal messages. Verbal and nonverbal messages are exchanged in face to face interviews, while only verbal messages are exchanged in telephone interviews.
2. Much of the emphasis in developing a digital library is to facilitate access to a wide area of resources for a particular audience--the proposed users.
3. VALE is so new that no previous research focusing on the user and organizational goals have been accomplished.
4. This study may provide insight for developing a usable distributed system in academia.

I conducted the information gathering interviews with selected members of the VALE Steering Committee. The main goals of the interviews were to determine the common perception of audience, whether any were perceived by the selected institutions, and the organizational motives for participating in the VALE project. This section describes the methods used to evaluate the user and organizational aspects of project participation.

Informational Interview Design

The informational interviews consisted of thirteen questions. The subjects were asked all thirteen questions. The questions consisted of specific questions aimed at determining if user and organizational aspects of participation were known and possessed common factors. The questions varied in wording and were designed to return some matched answers. The subjects were asked the questions by way of both telephone and face to face interview. The interview responses were recorded in writing and were audiotape recorded in most cases. The subjects were allowed to ask for clarification of any question, if the questions were unclear during the interview. The variables of the study are outlined below:

- Library database search skills of the user community and
- Organizational motives for participation in the VALE project.

A non-methodical sample of six institutions was selected from the fourteen-member steering committee. To prepare for the interview, the Internet home page and libraries of the selected institutions were accessed using the Internet to obtain information on the institutions before the scheduled interview.

The research questions were formulated in advance of the scheduled interviews as required. Both face to face and telephone interviews were conducted. This was done because I believed:

1. verbal exchange of messages were possible in both methods and did not compromise participation of the subjects;
2. I would be able to ask additional questions rather than if I used a self administered questionnaire; and

3. I would be able to use mirroring techniques to enable short yet accurate paraphrase responses to each question.

I conducted the interview by first sending an introductory statement, by electronic mail, about the researcher, briefly explaining the purpose of the study, and asked the subjects to advise of a convenient date and time for the interviews.

Most of the subjects returned electronic response's indicated the preferred times and dates from which I made feasible selections while others were contacted by telephone to set the date and time schedules. Two interviews were conducted face to face while the others were done by telephone. The reasons for the split in method were due to location constraints of some of the subjects; while others had time conflicts and had to be scheduled at the last moment. Each subject was asked to allocate twenty to thirty minutes for the interviews.

The survey instrument was the information-gathering questionnaire. I designed the questionnaire from typical interviewing questions focused on determining user and organizational aspects of participation. Most of the questions were open ended and mirrored to acquire information about how user aspects were formulated by the institution and the accuracy of the responded interpreted by the interviewer in the pertinent areas of inquiry. As with most studies, the institutions were classified into three categories to better interpret the results with an appreciation for the homogeneity and heterogeneity of the subject pool. The three categories are independent, state university and community college.

Statistical analysis of the data consisted of isolating the specific questions that dealt with user and organizational aspects then matching common responses and user identification for all subjects.

Subject Demographics

Though VALE has 45 member institutions, the survey was conducted from the fourteen-member steering committee. Of the 14-member steering committee, 6 participated in the survey to give a 13 percent response rate. The steering committee members are from three sectors: independent, state university, and community college. There were no major requirements from the subjects except for their participation in the VALE project. The subject classified as independent institutions reports a user community of 9,949 FTE or 5% total FTE; the subjects from state university report 17,707 FTE or 8% of total FTE; and community college reports 11, 044 FTE or 5% of total FTE. The total community user is 18%.

Equipment

The interviews were conducted in person and by the telephone for interviewer and interviewee convenience. A General Electric Micro Cassette recorder was used for personal interviews and a Sony Cassette Recorder with a telephone recording control device was used for the telephone interviews. Both methods were performed with advanced schedule appointment with only one exception. The interview exception was not planned but rather resulted from initial telephone contact and the availability of the subject. 5 interviews were tape recorded and later debriefed for information content.

Data Collection

Two types of data were collected: (1) the subject response to the survey questions as they were interpreted by the interviewer and (2) the tape-recorded subject responses (for accuracy and completeness of answer to the individual questions. See Appendix A for the actual interview questions). The subjects were not timed but allowed as much time as necessary to respond appropriately.

Basic Procedure

Each subject was sent introductions of the interviewer and a brief background of the research project to be performed before conducting the interviews by way of electronic mail. At the actual scheduled interview, the introductions were repeated and the subjects were asked each question, giving clarifications were necessary. The interviewer used a mirroring technique at confirm the written accuracy and completeness of the responses to each question. They were asked to verify their response to eliminate errors in the written record of the responses. After all the questions were asked and responses recorded, each subject was given the opportunity to add to their responses as necessary. They were also asked to articulate the overall personal feelings and general reactions about their participation in VALE up to now.

The Interview

Thirteen questions were posed to each subject relating to both user identification and organizational involvement. The first and earliest questions were designed to focus on what they thought of the project process, its prospects for their individual institution, and toward determining overall reasons for the organizational involvement. The eighth question was the most specific and directed towards identification of the institution's

users. The session audio tapes were numbered to track institution and their responses during the information gathering interviews.

Timing Technique

The subjects were not timed. The questions were posed individually and discussed at length where necessary. When all questions were answered, the interview concluded, the tapes were labeled, and later analyzed against written notes.

General Feedback

After each information interview, the subjects were asked to express general comments about the project and their responses and suggestions, if any, were noted. The data gathered was primarily intended to determine the features of improvement necessary for the project.

3.1 Research Methods

Subjects were asked to answer thirteen pre-prepared questions as the interviewer recorded the data on questionnaire sheets and audio tape-recorded each conversation in its entirety. The subjects were asked questions relating to user identification and organizational participation. The areas of questions were selected because they satisfied the user and organizational inquiry.

The informational gathering interviews were conducted to obtain information for a detailed analysis of six institutions from the steering committee: two each from the private, state, and community college sector.

Coding System

The coding for the interview responses were separated into two large genera. The first was related responses, which included all comments made relating to the questions including those that were only partially related. The second covered unrelated responses to the question. The large genera of responses were split into two sub-genera: direct and indirect response. The indirect responses were general and subjective while the direct responses was a direct quote or a mirroring of the actual statement as it was reiterated to the subjects for confirmation. Direct and indirect responses are equivalent responses where one is general and subjective and the other is more pointed. In this analysis, the distinction proves interesting but not critical. The more prominent indicators in the final analysis the differing responses that were labeled user or organizational aspects.

User Aspects- This category included any statement concerned with the user of the VALE system, where the subject used terms specifically related to the user or infers towards user.

Organizational Aspects- This category included any statement concerned with the organization or organizations of the VALE system, where the subject refers specifically related to the organization or its administration.

Firstly, in coding the conventions, all responses were coded as indirect or indirect, but each statement could carry multiple coding based on the language or word use in the responses that has user or organizational aspects. The unit of measurement for organizational aspects were 'resource, sharing and access' or a combination of words with similar meaning.

The units of measure for user aspects were 'user, students and faculty,' or a combination of word with similar meaning. Exceptions were made only in questions that did not generate responses with either term.

The Virtual Academic Library Environment is a digital academic library, scheduled for unveiling in November 1998, created through a partnership involving content providers and 45 academic institutions in New Jersey.

The Content Providers

The initial content of VALE is consists of UMI Research, PsycINFO, AIB Research 11, and CINHAL. The steering committee and task force groups presented and selected the database included in the system. Once final database selections were made, provider agreements were executed with the respected companies. The agreements included terms and right for distributing content through VALE. In return, the students and faculty of the member institution gain electronic access to scholarly and research information contained in the databases. Other content at individual institutions will be made available later as VALE expands.

Academic Institutions in New Jersey

The 45 member institutions of VALE are the ultimate authority of the digital library. It determines through consensus, what VALE's content will consist of for the users. Materials will include abstracts and full text of scholarly material to satisfy disciplines such as psychology, Nursing/Health, Business, and general knowledge information. The responsibilities of content cataloging, and indexing is the sole responsibility of the respective content providers.

Since VALE is accessible through the Internet, it has the potential for a worldwide audience. Its creation is funded to serve the academic needs of the member institutions only. For the initial implementation phase of the project, access to the digital library will be limited through specific I. P addresses. The workstations in the libraries are standardized with networked hardware and software, configured to run OCLC's SiteSearch interface software. The SiteSearch software is always active on the workstations, displaying the VALE icon even if they are not being used. If a student or faculty uses a workstation, and then left idle for more than 10 minutes, it is automatically reset back to the main screen of the library. This makes the workstation easier to use by novices who will always access VALE from the same point.

Introduction on how to use VALE can be accessed from VALE's main page. Students in each member institution have the option of attending training sessions on how to use the Internet and VALE in each library. Library staffers will facilitate the training sessions.

Table 4: VALE databases. Descriptions obtained from URL: http://www.oclc.org/oclc/fs/9085fs/descrev.htm

Database	Description
AIB/INFORM-UMI	Covers nearly every aspect of business, including company histories and new product development. Citations include abstracts and indexes of significant articles nearly 1,748 current business and management periodicals. Provide access to ASXCII full text of articles from more than 700 journals(1,574 K. Records)
CINAHL	The online version of **C**umulative **I**ndex to **N**ursing and **A**llied **H**ealth **L**iterature. Provides access to approximately 900 nursing, allied health, biomedical, and consumer health journals. Also, include books, dissertations, standards of professional practice, and educational software. Include abstracts of over 300 journals that date to January 1986.
PsycINFO	An American Psychological Association database offered in three files: -1887-present, 1967-present, and 1984-present. Rich resource

Table 4: VALE databases descriptions (*continued*)

Database	Description
	for historical research in psychology and selected disciplines-- now with journal coverage back to 1887. Contain citations and summaries of journal articles, chapters, books, technical reports, and dissertations in psychology and related disciplines. Over 55,000 references are added monthly. Descriptors from the Thesaurus of Psychological Index Terms are assigned to records from 1967 to allow precise searching using the language of the discipline. Include indexed material from more than 1,400 journals published in 50 countries and 30 languages. Chapter and book coverage includes worldwide English-language material published from 1987 to the present. (1534 K Records)
UMI-Research II	Periodical Abstracts that features general and academic journals covering business, current affairs, economics, literature religion, psychology, women's studies and others. (3,323 K Records)

In an effort to secure a desirable information future, there is an on going change, internationally, in libraries and the information services they provide to patrons. To achieve these goals, states are moving in strategic directions in a short period to secure a place in the National Information Infrastructure. Rather than accepting a role of passive recipients, libraries are becoming mediators on the information highway. In their role as mediators, libraries are responsible for the information products and services within their organizations. Continuous updating in subject disciplined is essential for academic libraries; especially since they are revered as major information providing resources for its customers--the students.

The optimum solution to the technological trends affecting libraries, seems to be working together to assure that each library has the information and equipment needed to remain on the forefront of information services as we enter the new millennium. In an important step toward resource sharing and anytime anywhere electronic access, 43 of New Jerseys academic institutions have joined together to create the Virtual Academic

Library Environment (VALE). VALE is in its infancy and has some very important consideration for its nearly 220,000 FTE students.

CHAPTER 4

4 RESULTS AND DISCUSSION

This section describes in detail the results that I obtained from user and organizational aspect analysis. I divided the results into two sections' one for user and the other organizational participation. For each measure, I counted the use and near use of terms related to user determination and organization participation. Additionally, for each user and organizational aspect, I show the results for all subjects with questions and responses. The appropriate inference was made based on the results. The Table 5 below shows the result of response coding in the two genera discussed previously.

Table 5. Genera of Subject Responses

				Genera of Responses	
Subject	**Total Responses**	**Direct Responses**	**Indirect Responses**	**User Aspects**	**Organizational Aspects**
SPC	19	17	2	4	5
SHU	20	19	1	4	8
MSU	20	18	2	11	5
ACC	20	17	3	5	6
CCC	21	19	2	9	9
KU	29	26	3	4	8

In the following analysis of the user aspects, each response is reviewed and analyzed for direct or indirect responses to user. The organizational assessment was made in a similar manner, for direct and indirect responses related to organization. Direct responses for user aspects included the use of the term "user," "student and/or faculty" for all questions. Direct responses for organizational aspects included the use of term "resources," "remote and/or access," for all questions. To ensure accurate measure for evaluation, the answers to each question was assesses for the actual words or words with similar meaning.

In almost all subject responses for user, the count was 4 or 5 for more than 50 percent of the subjects. The subjects MSU and CCC had a count of 11 and 9 respectively for user related responses, indicating a high user concern by these member organizations.

Organizational responses are given similar scrutiny as user responses. The responses for organization yielded a near 50/50 distribution for organizational aspects. While the distribution among the three sectors had minimal significance, the analysis did give a somewhat significant difference between user and organizational aspects. The organizational measure if averaged between sectors would be a 7, while user average measure would be 6. Indicating that organizational aspect was the common focus of VALE members' participation over user aspects. All six subjects incorporated both user and organizational aspects as a criterion of participation, however no common user determination was indicated.

If one wished to extract even more significant but inconclusive results from these findings, it could be implied that 5 of 6 subjects placed a 1:1 or better emphasis on organizational aspects. There are no dramatic results from the analysis. The coding variable used as the measurement is based on response content analysis allowing words in the interview data to be the qualifiable heuristic device. The data analysis caught only minimal patterns

The presence of user aspects indicates that the user was given some consideration in the institutions' participation in the project. Moreover, it is not merely important to implement the system, an assessment of user aspects is especially important when trying to uphold the considerations established by the physical library.

The hallmark of usability remains reliant on occasional usability evaluations to provide services to patrons with a diverse mix of needs.

Since the Virtual Academic Library Environment is so new, it is prudent to form only tentative conclusions. VALE is a digital library consisting of 45 academic organizations that requires telecommunication technology to link the resources for a diverse mix of users. The link between the organizations and the users are almost transparent to the user but it fulfills the goal of remote electronic access. The purpose of VALE, as indicated by the interview subjects is to:

- promote the economic and efficient information resource to nearly 220,000 FTE student users;
- take a leadership role in the dissemination of knowledge in important research areas; and
- prepare for participation in the National Information Infrastructure.

In this case study six subjects responded to questions during information gathering interview designed to determine user and organizational aspects. Keeping in mind that the goal of this case study is to formulate a collective determination of user and a common reason for participation. Factors that were unknowns at the beginning of this study, the responses to the questions provided enlightening information to measure the stated research hypothesis. The actual responses to the interview questions for all subjects are specified in Appendix A1-A6 of this document.

The study of common user determination revealed that the library database search skills of institutional user community delineated no collective user determination. Responses indicated that users ranged from novices to intermediate. No subject reported

having expert users as the average user. The study revealed that the interview subjects account for 6,248 novice users, 9,296 novice and occasional users, and 7,004 intermediate users. Novices were reported in all three sectors (Independent, State, and Community Colleges) of the institutions interviewed.

Considering the above, the average or mean of users for VALE can be determined as Occasional or Mid-level/Average. Translated further, the average perception of VALE users is average or can be characterized as occasional users. The categorizing of users as occasional or mid-level average is only a perceptual view of the audience. The interface should meet this minimum criterion when the system is implemented. While this is not an easy task, it helps to remember that VALE is not a developer, but has committed itself to ensuring remote electronic access to integrated library resources for all VALE member organization.

CHAPTER 5

5 CONCLUSION

In this paper, I examined the user and organizational aspects of six subjects of the VALE project that represent three sectors of memberships. Each subject is an organizational link in the VALE community and has implied in their statements that organizational aspects are the most important aspects of participation. If organizational aspects are the most important aspects of participation for all VALE members, then organizational usability goes beyond interface design as suggested by Kling and Elliott in Digital Library Design for Usability. Digital library systems that are easy to learn and use must be implemented and represent a fit between the system and the "social organization" of user in a specific organization. This can be accomplished by accommodating the diverse mix of user skill levels present in VALE (Kling and Elliott 94). A diverse mix of users clearly makes it necessary to understand proportionately where the organizational user skill fall.

The newly implemented VALE system has being introduced to the 45 member institutions of diverse sectors of the academic community. The study showed that institutional members of VALE brought an organizational ideal of their users and that organizational behavior is intended to produce user adaptation over time. Furthermore, the cost saving together with extended resource sharing is the driving force of participation. Considering these discoveries, further study should be devoted to the following:

- Further usability studies of users from all member campuses
- Training for new VALE system users.

- Initial and continued focus on the users of the VALE system.

User adaptation, acceptance, training and ongoing support are arguably critical success factors for most organizations. The introduction of a new information system into an organization brings formidable challenges for user and the organization itself.

A digital library where the organization and its users have some input makes the difference between a usable; task oriented system and one that is a useless waist of money. Specifying the users and setting reachable short and long term goals are primary issues, followed by the mapping of an interface for information searching and retrieval. Next, organizers can create the interface with handles for specific actions. Finally, the digital library must be developed in a visual format, while providing access for users from all backgrounds.

5.1 Recommendations for Further Study

To tie together all the research data of this case study to the requirements of a large distributed system like VALE digital library use, I recommend implementation of a inter-campus usability study plan.

APPENDIX A-1

In studying New Jersey's VALE the following questions were addressed:

Questions =Q- # and Responses = R- # for **Subject 1 - Saint Peter's College (SPC)**

	Question Type	
Q-1.	Open	**Why did you decide to participate in the Virtual Academic Library Environment (VALE) project?**
R-1.		The ability to shared resources that contributes to our efforts to maintain a reputation as one of the library leaders in technology while bringing libraries together. Additionally, SPC wanted to participate in a project that has the promise of evolving to the status and magnitude of Galileo, OhioLink, and VIVA.
Q-2.	Informational probe	**Were other systems surveyed before selecting VALE?**
R-2.		No other database systems were surveyed in particular. SPC examined the use of the Internet as a library resource for cataloging. Additionally, SPC looked at Z39.50 software to interface with other Internet resources.
Q-3.	Informational probe	**What do you expect to get out of VALE?**
R-3.		More affordable databases, a common interface, access to other academic sites and Inter-library lending.
Q-4.	Informational probe	**Describe the decision making process?**
R-4.		We analyzed the budget for cost/savings first. The fact that VALE offered a common interface was an important marketing tool.
Q-5.	Closed	**VALE currently has four databases—UMI Research II, (UMI's) ABI/Inform, PsycINFO, and CINAHL. In which of the following category does this institution fall:**

A. We had a previous database that we elected to discontinue and replace with VALE and now you have

VALE only? Was your previous database the same or similar to VALE? Were they similar to the VALE databases?

B. We had a previous database and chose to keep it and add VALE?

C. We had no previous database. Vale is the first database?

D. We joined VALE to get database?

R-5. Both A and B are applicable.

Q-6. **Informational probe** **What library database(s) do you currently have?**

R-6. Several including the following: Dow Jones News/Retrieval (include the Wall Street Journal), New York Times PsycLit, Modern Language Association Bibliography Commerce Clearing House Federal Taxes, ERIC, Education Index, Kraus Curriculum Development Library, ALT-HEALTHWATCH, Case Management CD-ROM, National Trade Databank and Stat-USA, and various minor database on CD-ROM.

Q-7. **Informational probe** **What databases do you subscribe to that were not included in VALE? Are there any other databases that you considered purchasing? Is so why?**

R-7. SPC subscribes to the following non-VALE compatible databases: Dow Jones News/Retrieval (include the Wall Street Journal), New York Times PsycLit, Modern Language Association Bibliography Commerce Clearing House Federal Taxes, ERIC, Education Index, Kraus Curriculum Development Library, ALT-HEALTHWATCH, Case Management CD-ROM, National Trade Databank and Stat-USA, Various minor databases on CD-ROM, some of which are similar to those, offered by VALE.

Q-8. **Open** **What is the library database search skill of the institution's user community?**

R-8. SPC users can be described as novices or unsophisticated. This descriptio: nes from close observance by the library staff and the assistance given over the past couple of months.

Q-9.	**Open**	**What are the benefits of VALE participation to your user community?**
R-9.		Assess to more database resources and full text to be picked up of some of the databases not available before remotely thereby expanding access for the SPC users.
Q-10	**Open**	**What issues were addressed in the development, design, and implementation phase of the project?**
R-10.		The interface, quality of the databases and the quality of the indexing of the material.
Q-11.	**Open**	**What will be the impact of VALE on your institutions' library and their users?**
R-11.		Cost Savings for SPC, access to more databases, common database to learn to search more library cooperation through various services such as inter-library lending.
Q-12.	**Open**	**What factors do you think have contributed to the success of the project up to now?**
R-12.		Tenaciousness of the people involved along with the availability of state money to assist the effort.
Q-13.	**Informational probe**	**Do you expect to participate in the future?**
R-13.		Yes. With the prospect of improved high speed link, broadcast searching, IT training for member librarians leading to training of students' faculty and administration the future success is just within reach. Continued support means win, win situation for the members now and those that will join in the future.

APPENDIX A-2

Questions =Q-# and Responses = R- # for **Subject 2 - Seton Hall University (SHU)**

	Question Type	
Q-1.	Open	**Why did you decide to participate in the Virtual Academic Library Environment (VALE) project?**
R-1.		The potential to share resources and add greater buying power for SHU was one of our motives for participation.
Q-2.	Informational probe	**Were other systems surveyed before selecting VALE?**
R-2.		A few like PALINET Products, OCLC's FirstSearch, EBSCO, UMI's ProQuest, in addition, to a few others.
Q-3.	Informational probe	**What do you expect to get out of VALE?**
R-3.		Access to additional databases and equipment.
Q-4.	Informational probe	**Describe the decision making process?**
R-4.		Economics of an alliance between the academic community and the potential of the consortia in the future.
Q-5.	Closed	**VALE currently has four databases—UMI Research II, (UMI's) ABI/Inform, PsycINFO, and CINAHL. In which of the following category does this institution fall:** A. We had a previous database that we elected to discontinue and replace with VALE and now you have VALE only? Was your previous database the same or similar to VALE? Were they similar to the VALE databases? B. We had a previous database and chose to keep it and add VALE? C. We had no previous database. Vale is the first database? D. We joined VALE to get database?

R-5.		Both A and B are applicable.
Q-6.	Informational probe	**What library database(s) do you currently have?**
R-6.		We currently have: UMI ProQuest Direct, UMI Research II, ABI/Inform and Info, Trac SearchBank in full image, Lexis-Nexis, Silver Platter Resources (include CINANL, ERIC, GPO, MLA and SocioFile), Criminal Justice Abstracts, Dissertation Abstracts (UMI ProQuest), Elsevier Science Direct, PsycInfo type on CD's, and a lists of other gateway access to various Internet resources.
Q-7.	Informational probe	**What databases do you subscribe to that were not included in VALE? Are there any other databases you considered purchasing? Is so why?**
R-7.		UMI ProQuest Direct, UMI Info Trac SearchBank Lexis-Nexis, Silver Platter Resources (include CINANL, ERIC, GPO, MLA and SocioFile), Criminal Justice Abstracts, Dissertation Abstracts (UMI ProQuest), Elsevier Science Direct, PsycInfo type on CD's, Lists of other gateway access to various Internet resources. These databases have some material similar to those in the VALE databases.
Q-8.	Open	**What is the library database search skill of the institution's user community?**
R-8.		Our user search skills could best be described as above average. This is because the databases have been part of the library for over four years and the new users tend to adapt quickly.
Q-9.	Open	**What are the benefits of VALE participation to your user community?**
R-9.		Additional available resources and reduced cost over the next few years.
Q-10	Open	**What issues were addressed in the development, design, and implementation phase of the project?**

R-10.		The idea of VALE as a project is forward thinking and fits what SHU already has—using the Internet to enhance and expand the resources of the library. Additionally, it meant decentralized delivery from NJ campuses.
Q-11.	**Open**	**What will be the impact of VALE on your institutions' library and their users?**
R-11.		Cost savings that bring additional resources to the users. For example, next year and in years to come, as newer products are added the advantage of association and partnership also increases for the SHU individually and the consortia as an alliance.
Q-12.	**Open**	**What factors do you think have contributed to the success of the project up to now?**
R-12.		The idea in itself makes sense and the trend is forward thinking coupled with the state money support to help kick off the project. Additionally it allows all members the ability to learn and grow in an information rich society.
Q-13.	**Informational probe**	**Do you expect to participate in the future?**
R-13.		Yes, Absolutely. As long as there are advantages to the students at SHU and we can move into other areas of sharing.

APPENDIX A-3

Questions =Q- # and Responses = R- # for **Subject 3 - Montclair State University (MSU)**

	Question Type	
Q-1.	Open	**Why did you decide to participate in the Virtual Academic Library Environment (VALE) project?**
R-1.		Hold a promise of expanding individual resources for students, faculty, and administration and allows greater purchasing power as an alliance than as individuals.
Q-2.	Informational probe	**Were other systems surveyed before selecting VALE?**
R-2.		MSU evaluated the setup and operation of VIVA (Virginia's Academic Library), Galileo (Georgia's Academic Online Library), OhioLink and TexShare.
Q-3.	Informational probe	**What do you expect to get out of VALE?**
R-3.		Additional databases, training and a pooled expertise looking at databases for future expansion.
Q-4.	Informational probe	**Describe the decision making process?**
R-4.		**R-4.** Library Council at MSU initially sat down and discussed the situation. The idea was then brought to the VPAA/Provost and all agreed it was the direction to take based on where they were and where they wanted to go.
Q-5.	Closed	**VALE currently has four databases—UMI Research II, (UMI's) ABI/Inform, PsycINFO, and CINAHL. In which of the following category does this institution fall:** A. We had a previous database that we elected to discontinue and replace with VALE and now you have VALE only? Was your previous database the same or similar to VALE? Were they similar to the VALE databases?

	Question Type	
		B. We had a previous database and chose to keep it and add VALE?
		C. We had no previous database. Vale is the first database?
		D. We joined VALE to get database?
R-5.		Both A and B are applicable.
Q-6.	**Informational probe**	**What library database(s) do you currently have?**
R-6.		There are approximately 22 in total most are in minor subjects such a Music and Art and are on CD-ROM. PsycINFO and Current Context are the others.
Q-7.	**Informational probe**	**What databases do you subscribe to that were not included in VALE? Are there any other databases you considered purchasing? Is so why?**
R-7.		STAT USA, CENSTATS, EBSCO, JSTOR, SearchBank are a few that I can remember off the top of my head.
Q-8.	**Open**	**What is the library database search skill of the institution's user community?**
R-8.		Users are mixed but on the average most could be describe as mid-level. Our users are not all novices nor are they experts but based on the fact that the library has had automated databases for a few semesters the users a somewhat adept to searching based on author and title. Other types of searching may require some trial an error on the part of the new user but I believe that on the average they are all mid-level users.
Q-9.	**Open**	**What are the benefits of VALE participation to your user community?**
R-9.		Standardization of the interface across the academic campuses that makes it easy to learn and use whether a student is a freshman or transfer. Additionally, there will be a lessened frustration for students, faculty, and

	Question Type	
		administrators.
Q-10	Open	**What issues were addressed in the development, design, and implementation phase of the project?**
R-10.		Nothing specific to MSU.
Q-11.	Open	**What will be the impact of VALE on your institutions' library and their users?**
R-11.		Unknown at this point but expects to have quantitative data from both the VALE assessment and evaluation committee and internal MSU survey of users to determine the real impact.
Q-12.	Open	**What factors do you think have contributed to the success of the project up to now?**
R-12.		Timing of the availability of the bond issue in NJ, The fact that an alliance of the academic community serves to benefit the entire library community of New Jersey. The interests of people like, John Gaboury, Ann Cilberti, Maryann Gaunt, Richard Sweeney, and all the members of the VALE committee and Task Forces. The existence of other Digital Libraries such as Galileo that started with one Database in 1994 or so.
Q-13.	Informational probe	**Do you expect to participate in the future?**
R-13.		Absolutely yes. This is the beginning of what will be a successful project but whose continued success is grounded in how the academic user communities approach it overall.

APPENDIX A-4

Questions =Q-# and Responses = R-# for **Subject 4 - Atlantic Community College (ACC)**

	Question Type	
Q-1.	**Open**	**Why did you decide to participate in the Virtual Academic Library Environment (VALE) project?**
R-1.		VALE offers the promise of remote access for our students, faculty, and administrators. Greater purchasing power as an alliance and the proposed collaboration between academic libraries throughout New Jersey.
Q-2.	**Informational probe**	**Were other systems surveyed before selecting VALE?**
R-2.		Most regional libraries are part of a cooperative and looked at what the south jersey regional cooperatives were participating in and what they planned to participate. For example PaliNET or the various offerings by OCLC.
Q-3.	**Informational probe**	**What do you expect to get out of VALE?**
R-3.		Access to more databases remotely at a financial saving.
Q-4.	**Informational probe**	**Describe the decision making process?**
R-4.		The idea was born from the knowledge about the Bond issue availability and blossomed through the NJ Council of College Library Directors group. It was further narrowed in discussions with reference librarian and other staffers ACC.
Q-5.	**Closed**	**VALE currently has four databases—UMI Research II, (UMI's) ABI/Inform, PsycINFO, and CINAHL. In which of the following category does this institution fall:** A. We had a previous database that we elected to discontinue and replace with VALE and now you have VALE only? Was your previous database the same or similar to VALE? Were they similar to the VALE databases?

	Question Type	
		B. We had a previous database and chose to keep it and add VALE?
		C. We had no previous database. Vale is the first database?
		D. We joined VALE to get database?
R-5.		Both A and B are applicable.
Q-6.	**Informational probe**	**What library database(s) do you currently have?**
R-6.		We had CINAL prior to VALE and replaced with ABI/Inform, SIRS (not being used as much), Wilson Business Abstracts, US Supreme Court Reports, NJ Administrative Code, Electric Library and RIA, Encyclopedia of Science and Technology, National PhoneBook, and Lexis-Nexis.
Q-7.	**Informational probe**	**What databases do you subscribe to that were not included in VALE? Are there any other databases you considered purchasing? Is so why?**
R-7.		IAC (like EBSCO), OCLC Databases, SIRS (not being used as much), Wilson Business Abstracts, US Supreme Court Reports, NJ Administrative Code, Electric Library and RIA, Encyclopedia of Science and Technology, National PhoneBook, and Lexis-Nexis.
Q-8.	**Open**	**What is the library database search skill of the institution's user community?**
R-8.		Most of the ACC users would be characterized as novices.
Q-9.	**Open**	**What are the benefits of VALE participation to your user community?**
R-9.		Greater buying Power, interface consistency, and Inexpensive remote access to more databases.

	Question Type	
Q-10	Open	**What issues were addressed in the development, design, and implementation phase of the project?**
R-10.		Relevance of databases being offered to the academic disciplines offered by ACC as established by the survey done of the libraries involved. Additional the cost of the databases for ACC as an individual and as a member of the consortia. Politics within the institution—did the institution want to participate at this go round or wait until next year?
Q-11.	Open	**What will be the impact of VALE on your institutions' library and their users?**
R-11.		The sort term impact for ACC is access to more databases at a lower cost and long-term impact is the electronic services to offer students of the colleges in New Jersey.
Q-12.	Open	**What factors do you think have contributed to the success of the project up to now?**
R-12.		The activities of John Gaboury, Ann Cilberti, and others. The collaboration of library directors of the state. Realization of the faith place in the Library Council. Participation of Seton Hall and Rutgers to act as the Server Sites for the consortia.
Q-13.	Informational probe	**Do you expect to participate in the future?**
R-13.		Yes. Initial and continued support is the only way to ensure growth of VALE in NJ to the status of a Galileo, VIVA, OhioLink or TexShare. Therefore securing ultimate preparation for inclusion in the National Information Infrastructure (NII).

APPENDIX A-5

Questions =Q-# and Responses = R-# for **Subject 5 - Camden County College (CCC)**

	Question Type	
Q-1.	**Open**	**Why did you decide to participate in the Virtual Academic Library Environment (VALE) project?**
R-1.		Cost savings and VALE makes expanded resource sharing available for students and faculty.
Q-2.	**Informational probe**	**Were other systems surveyed before selecting VALE?**
R-2.		Group purchasing of the EBSCO product.
Q-3.	**Informational probe**	**What do you expect to get out of VALE?**
R-3.		Access to more academic periodicals on and off campus for students and faculty.
Q-4.	**Informational probe**	**Describe the decision making process?**
R-4.		Library council discussions initiated from awareness of state program to provide money for technological initiatives. I had prior knowledge of the benefits associated with cooperative alliances for purchasing services and products.
Q-5.	**Closed**	**VALE currently has four databases—UMI Research II, (UMI's) ABI/Inform, PsycINFO, and CINAHL. In which of the following category does this institution fall:** A. We had a previous database that we elected to discontinue and replace with VALE and now you have VALE only? Was your previous database the same or similar to VALE? Were they similar to the VALE databases? B. We had a previous database and chose to keep it and add VALE? C. We had no previous database. Vale is the first database?

	Question Type	
		D. We joined VALE to get database?
R-5.		Category A applies.
Q-6.	Informational probe	**What library database(s) do you currently have?**
R-6.		Using the VALE Research II and CINHAL. Had the EBSCO Host Master file (in full text) was replaced with VALE's UMI Research II and CINAHL. Both of these databases support health related and liberal arts disciplines offered at CC.
Q-7.	Informational probe	**What databases do you subscribe to that were not included in VALE? Are there any other databases you considered purchasing? Is so why?**
R-7.		Various in house products on CD-ROM like FACTS on FILE and SOJOURN. In addition, the library uses ERIC on CD and from the Internet.
Q-8.	Open	**What is the library database search skill of the institution's user community?**
R-8.		Most of CC's students are computer literate but not familiar with the differences between a keyword and a subject search. On this basis, the users would best be characterized as novices.
Q-9.	Open	**What are the benefits of VALE participation to your user community?**
R-9.		Access to an authoritative mix of periodicals and increased access to resources and the Internet.
Q-10	Open	**What issues were addressed in the development, design, and implementation phase of the project?**
R-10.		Internal security problems library does not support E-mail. We had a few workstations (13 in total) in the library. We plan to convert all 13 workstations to uniform interface with

	Question Type	
		icons and browser and the same access for all the available systems.
Q-11.	**Open**	**What will be the impact of VALE on your institutions' library and their users?**
R-11.		The biggest foreseeable impact will be on the library itself and the staff. The library must modify its instruction for students and faculty and emphasize a strong internal communication network between colleagues. The impact on the students and every one else rests squarely on the library and its ability to take users through a smooth transition.
Q-12.	**Open**	**What factors do you think have contributed to the success of the project up to now?**
R-12.		The activities and support of many including, the William Paterson President, Ann Cilberti, John Gaboury, also of WPU and the giant in academic library in New Jersey—Princeton and Rutgers.
Q-13.	**Informational probe**	**Do you expect to participate in the future?**
R-13.		Yes. This is just the beginning of the consortia. We are now 43 and next year hopefully we can double our membership that should not be difficult if public and other types of libraries join the group. Access to the collections held by the varying institutions, public and private, in New Jersey is goal of VALE or should be.

APPENDIX A-6

Questions =Q-# and Responses = R-# for **Subject 6 - Kean University (KU)**

	Question Type	
Q-1.	**Open**	**Why did you decide to participate in the Virtual Academic Library Environment (VALE) project?**
R-1.		Service Expansion that is long over due at Kean and in NJ. VALE affords us shared resources on an off campus. Aware of the Galileo model and what can be achieved through cooperation.
Q-2.	**Informational probe**	**Were other systems surveyed before selecting VALE?**
R-2.		Looked into other online systems in operation like Galileo, OhioLink. Evaluated their set up, utilization of online services coupled with select databases and most importantly cooperation of institutions.
Q-3.	**Informational probe**	**What do you expect to get out of VALE?**
R-3.		Access to databases and other resources, cooperative buying and improved resources for Kean over all.
Q-4.	**Informational probe**	**Describe the decision making process?**
R-4.		We did not want to sacrifice long term gain for short-term gain. President was all for the project. Staff and librarians were anxious to move to this venue. Our departmental liaison input and support though consensus was necessary to move forward.
Q-5.	**Closed**	**VALE currently has four databases—UMI Research II, (UMI's) ABI/Inform, PsycINFO, and CINAHL. In which of the following category does this institution fall:** A. We had a previous database that we elected to discontinue and replace with VALE and now you have VALE only? Was your previous database the same or similar to VALE? Were they similar to the VALE

	Question Type	
		databases? B. We had a previous database and chose to keep it and add VALE? C. We had no previous database. Vale is the first database? D. We joined VALE to get database?
R-5.		Category B. We had previous databases and chose to keep it and add VALE.
Q-6.	Informational probe	**What library database(s) do you currently have?**
R-6.		Most are similar to VALE. They include UMI full image, PsycLIT, Wilson, CINAHL, EBSCO. All of which represents the academic disciplines offered at Kean. Vale duplicates some of what is already offered but expands their access to the resources.
Q-7.	Informational probe	**What databases do you subscribe to that were not included in VALE? Are there any other databases you considered purchasing? Is so why?**
R-7.		Kean subscribes to Wilson, EBSCO, PsycLIT, and Books in Print, Encyclopaedia Britannica. They will keep these databases with VALE. Users are familiar with the products. Despite their participation with the consortia, they do not want to lose Kean's individuality in the process. So for this reason the have elected to keep these sources.
Q-8.	Open	**What is the library database search skill of the institution's user community?**
R-8.		Users fall below intermediate but not are novices on average.
Q-9.	Open	**What are the benefits of VALE participation to your user community?**

	Question Type	
R-9.		Expanded resources, immediate availability of text, Internet access, availability of resource to multiple users, good teaching tool.
Q-10	Open	**What issues were addressed in the development, design, and implementation phase of the project?**
R-10.		How it works, the promise to expand their resource beyond Kean's financial capabilities in the future and the probability of continuation of the project in the future.
Q-11.	Open	**What will be the impact of VALE on your institutions' library and their users?**
R-11.		Project only a positive impact for the first and all subsequent years into the future. VALE affords the economical purchase of multiple resources through cooperative buying.
Q-12.	Open	**What factors do you think have contributed to the success of the project up to now?**
R-12.		The hard work of John and others involved who have put forth sweat and sacrifice to make it all work for all participants. Not everyone got everything they wanted but participated in what they needed for now and looking forward the possibilities, that expansion holds for the future.
Q-13.	Informational probe	**Do you expect to participate in the future?**
R-13.		Yes. Looking forward to the forward expansion of the project in the next two years. Additionally, hoping the state adds a lime item to its budget to help continually fund the expected growth and expansion of the next couple of years.

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