INFORMINE: Unique Web Resource for Revolutionary Projects in Education

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Part One: Introduction to INFOMINE

What is INFOMINE?

INFOMINE is a virtual library of Internet resources developed by a Project Team at the University of California, Riverside Library (UCR). It is a value-added, enhanced, and customized hypertext virtual library of Internet resources of interest to the wider university community. It is composed of a sophisticated database management tool and search engine which provides easy access and links to the identified resources. [1]

How was INFOMINE developed?

INFOMINE is possible because of the existence of three key developments: the Internet, the World Wide Web, and Platform-neutral web browsers.

The Internet provides for the electronic transfer of ASCII text across a set of networks interconnected with routers which forward the traffic across and between various other networks. It is estimated that there were 20,242 unique commercial Internet domains in September 1994, which was 10% more than in the previous month. [2]

The World Wide Web was developed at the European Center for High-Energy Physics (CERN) as recently as 1990 as the means by which CERN's widely-separated researchers could communicate graphical as well as textual information more effectively. For the first few years, the web developed very slowly, and by January 1993 there were only about 100 sites. However, with the development of web browsers in that year and their wide dissemination in academia, sites developed exponentially. By March 1993, there were 1,200 sites. One year later that number had doubled, and today there are an estimated 145,166 web servers, and that number has grown six-fold during the last year. [3]

In May 1993, Honolulu Community College was developing what is now recognized as the first academic web page, but the University of California, Riverside began developing INFOMINE in the summer of 1993, with dissemination by early 1994.

Web Browsers made the difference. Web browsers, such as Mosaic and Netscape provide the following necessary complements to the web technology:

Display control of hyper-text
Display control of hyper-media
Linkable media
Support for different platforms (IBM, Mac, UNIX, for example)

Markup languages to add resources
User-friendly screen information

Who developed INFOMINE?

Two librarians at UC Riverside must be given credit for the vision and the technological understanding to develop this project. They are Steve Mitchell, Science Reference Librarian, and Margaret Mooney, Head of the Government Publications Department. They, with the help of UCR staff, students, and faculty, set the parameters and goals for the successful growth of INFOMINE. The current INFOMINE development team also includes Carlos Rodriguez, another Science Reference Librarian. Administrative oversight and the integration of INFOMINE into the rest of the Library's and University's operations is handled by an Information Technology Committee.

Why was INFOMINE developed?

The Internet, the World Wide Web, and freely-available web browsers encouraged the proliferation of sites in this medium, and the academic community needed some way to sort out what was valuable to enhance the educational process. Librarians, typically the interpreters and selectors, the annotators and indexers, of information, in whatever format, took on this responsibility in the new electronic environment, much the same way as with print resources.

As the world approaches the new millennium, the library world finds itself on the "cusp" between the Industrial Age and the Information Age. Librarians find themselves addressing sometimes conflicting issues between the physical, paper, locally-owned library of stored information and the virtual, decentralized, cooperatively-funded independently-accessed world of electronic information. INFOMINE was developed as an attempt to harness the subject skills of librarians in a collaboration to avoid duplication of effort while still meeting the various and diverse information needs of libraries' clientele. [4]

How is INFOMINE unique?

There are many different kinds of Internet resource finding tools in the web environment. Steve Mitchell has described them in categories such as search engines, meta-search navigators, subject guides, and virtual libraries. As he explains, INFOMINE is classified as a virtual library by virtue of the fact that it contains "...substantial numbers of links to Internet resources organized via subject categories created by someone familiar both with the topic and how people would seek information within it.... [Virtual libraries] are more comprehensive than subject guides, and with less narrative." [5]

INFOMINE is unique among virtual libraries because of the combination of the following characteristics:

1. INFOMINE's level of annotations and standardized indexing. Utilizing Library of Congress Subject Headings (LCSH) provides a standardized descriptive language familiar to librarians in all disciplines and facilitates the transfer of cataloging

information between online catalogs and INFOMINE. [6] Annotations, either culled from the resource or composed by the INFOMINE contributor allow the user to evaluate a resource before linking to it. See Appendix A for a sample indexed and annotated reference from INFOMINE.

2. INFOMINE's sophisticated search techniques. Boolean operators in keyword, subject, and title word indexes are utilized by user-defined choice in establishing the search strategy.

3. INFOMINE's hypertext database management systems. INFOMINE's database manager functions have the capacity to generate on-the-fly, virtual tables of contents of linkable Internet resources arranged by broad subject categories. This feature allows users to browse and access up-to-date Internet resources without the need for librarians to manually maintain and update Web pages. The database manager utilizes PERL and C++ software in an mSQL environment.

4. INFOMINE's ease of use in adding new resources. INFOMINE's database moderators, also called "facilitators," encourage contributions from others. INFOMINE's forms-based resource adder and editor allows contributors to add new resources or to edit and delete existing INFOMINE records as appropriate. Adding new resources to INFOMINE databases is a simple four-step process: **1)** selecting Internet sites; **2)** assigning standard LCSH subject headings **3)** assigning free-text keywords; and **4)** providing annotations. [7] In contrast to robotic search engines which utilize minimal human input, the subject specialists assign relevant focused indexing terms after reviewing the resource. INFOMINE features a built-in automatic HTML conversion function, eliminating the need for contributors to acquire Hyper Text Markup Language skills.

5. INFOMINE's high relevance in meeting the research and instructional needs of its users. INFOMINE's resources are grouped by discipline. INFOMINE presently contains eight broad subject/discipline oriented databases:

> **B**iomedical, Agricultural and Medical
> **G**overnment Information
> **M**aps and GIS
> **P**hysical Sciences, Engineering, Computer Science, and Mathematics
> **V**isual and Performing Arts
> **S**ocial Sciences and Humanities
> **I**nstructional Resources
> **I**nternet Enabling Tools

Together, these eight databases provide links to over 5,000 relevant resources. Two additional databases which cover the UCR campus and other UC/Regional web servers are also part of the INFOMINE system. INFOMINE also provides a "What's New" current awareness feature, which automatically gives users links to new resources added during the past 20 days. (See Appendix B for a sample of the INFOMINE homepage.)

To overcome the problem of "disappearing" Internet sites, INFOMINE contains an automatic, customized URL checker. This function periodically checks the linkability

of Internet resources indexed in INFOMINE databases. Resources which can no longer be accessed are flagged for further verification by the database moderators.

6. INFOMINE's resources are selected by subject specialists. Each database's moderator ensures the quality and the integrity of his or her database. Currently, indexing for over 5,000 Internet resources is available in the INFOMINE databases. The Biological, Agricultural, and Medical collection and the Government Information collection are especially strong in meeting the research and instructional needs of UCR and the broader academic community and have been acknowledged in several recent publications. [8]

To summarize, INFOMINE is:

- One of the First academic web sites
- One of the largest for its clientele
- Relevant to the Academic/Learning Environment
- Offering customized selection and value-added indexing and annotations
- Offering multiple access points for ease of searching

Future plans for INFOMINE include (1) the identification of wider uses of INFOMINE, such as cooperative projects with institutions and community agencies; the development of new databases; creation of links to other electronic resources such as the UC Melvyl system and local online public access library catalogs; and increased collaboration with faculty, librarians, and others in the educational community.

Four current projects define this increased collaboration:

1. NetGain. NetGain will provide book selectors the opportunity to utilize their connections to academic departments on the university campuses to elicit recommendations for contributions to INFOMINE from the faculty and graduate students who, while teaching, utilize the Internet, or who would do so if resources for their subject areas were represented on INFOMINE.

2. Internet Government Information Project (IGIP). IGIP is a collecting project for government information resources, with participants from the nine UC campuses and Stanford University. [9]

3. Maps/GIS collecting project. Map Librarians affiliated with the Western Association of Map Librarians, including Mary Larsgaard at the University of California, Santa Barbara, are adapting LCSH terminology for the Maps/GIS database in a state-wide cooperative resource collection project.

4. Educational Outreach to Schools. An educational outreach program for UCR and regional educators is an important new project utilizing INFOMINE as a database for collecting shared resources for education, and disseminating information to the schools themselves. This project has implications for the role of the University in the community, for distance education as an innovative way to enhance networked communication, and for the Library's role in collaborative projects.

The UCR Library, with strong support from the Campus Administration, has developed a 3-year pilot program to collaborate with schools in two California counties. Thirteen schools representing three elementary schools, four middle schools, four secondary (high) schools, and a community college have been identified for accelerated access to the electronic resources of the UC System through the Internet. The remainder of this paper will describe this project in more detail. [10]

Part Two: Educational Outreach to K-14 Schools

Description of the Project: This is a three-year project designed to build a positive continuum of educational access to Internet resources for all educational levels in the Inland Empire of Southern California (Riverside and San Bernardino Counties). The project will result in enhanced educational opportunities for students (and teachers) at all levels, and will make the vast resources of the Internet - including the electronic library resources of the University of California - available to public educational institutions throughout the region. The project began in Fall of 1995 and consists of Three Phases.

Phase I: Development Phase. 1996 academic year

- University and campus resources identified.
- Schools and technological project liaisons designated.
- Technological infrastructure understood.
- Position of UCR Director of Library Outreach Programs established.

Phase II: Installation Phase. 1997 academic year

- Installation of appropriate computers in the school libraries and other sites at the pilot schools.
- Internet Access established on pilot project campuses.
- Internet training and hands-on experience for teachers and other educators at the pilot schools accomplished.
- Monthly meetings of participating schools implemented.

Phase III: Application Phase. 1998 academic year

- Development of a World Wide Web site, housed on INFOMINE, to serve as the host site for the project.
- Application of the Internet to classroom instruction and computer lab situations.
- Demonstration of the successful use of the Internet in K-14 schools.
- Promotion of the awareness of the potential value of the Internet to the curriculum.
- Acceleration of the implementation of Internet to other schools of the region.

How did this project get started? The University of California, Riverside is in a growth phase which estimates a increase from 9,000 to 25,000 students in the next 10 years. Clearly, to meet that need, a systematic development of new buildings, programs, and services for the students, faculty, and researchers is required. UCR had seen no new library buildings since 1968, and the Campus Administration, in

collaboration with the Library, mounted a successful campaign to secure funding for a new Science Library utilizing lease revenue bonds approved by the California State Legislature. UCR made a lot of friends in the process and it became apparent that UCR and indeed the entire University of California does not exist in a vacuum, but in a continuum which runs through the entire educational system. Providing access to the electronic resources of the new UCR Science Library was a logical way to fulfill our promise to become more of a community resource. This project is one step in that process.

The campus/community historic collaboration. UCR experiences a favorable relationship with the community. Community leaders take pride, and some still remember, that it was the citizens in this region that strongly supported UCR's establishment on the site of the Citrus Experiment Station in the 1950s. Today, the Citizens University Committee still works closely with Campus Administration to support the needs and growth of the campus.

Who are the University, Community, and Governmental Organizations that are most closely involved with this project?

The University of California, Riverside. UCR has several departments and programs which will contribute to the project.

The Library. The University of California, Riverside, is one of the 9 campuses comprising the University of California system. The UCR Library is a member of the Association of Research Libraries, with collections numbering 1.7 million volumes and 13,500 current serials housed in five libraries. The Bio-Agricultural and Physical Sciences Libraries serve the College of Natural and Agricultural Sciences and the College of Engineering. The Rivera Library, Media Library, and Music Library complete the five library sites.

Located 60 miles east of Los Angeles and 50 miles west of Palm Springs, UCR's 1,200-acre park-like campus was cited for its natural beauty in a recent New York Times Magazine article. Over 500 faculty teach and advise UCR's student body of 9,000 students. UCR is a land grant campus, and its many specialized centers and research institute contribute to a dynamic scientific and research environment.

California Educational Research Cooperative (CERC). CERC is a funded research activity which will study this pilot project for curricular applications and the appropriate use of technology. It is a cooperative research partnership sponsored by the Riverside County Office of Education, the California Public Schools, and the School of Education at UCR. A recent CERC report stated: "Student success, in its many forms, is arguably the primary goal of education. The student, the school, the family, indeed, all of society benefits from successful students." [11]

Comprehensive Teacher Education Institute (CTEI). CTEI provides master teacher and continuing education for new and experienced teachers. Two schools in San Bernardino County which participate in CTEI are part of this pilot project.

The Inland Empire. The Inland Empire, composed of Riverside and San Bernardino Counties, is among the fastest growing regions in the nation, with an economic base

currently larger than 18 U.S. states, and growing at a pace to be larger than 25 states by the year 2000. [12] Several Inland Empire organizations are participating in this project.

County of Riverside Internetwork (CORNET). CORNET reports to the County of Riverside and not to the school boards nor to the County Office of Education. CORNET grew out of the Smart Valley Electronic Community concept developed in the Silicon Valley of California in 1992. It's purpose is to provide interagency communication and to foster the exchange of information among local governmental agencies and educational institutions. [13]

Riverside County Office of Education (RCOE). RCOE is an interesting entity, in that it does not report to the County government, but is a local branch of the State government. RCOE allocates state funds to the school districts and advises on their expenditures. There is a comparable body in San Bernardino as well.

Local School Districts. Local School Districts have elected boards. School principals report to these locally-elected boards rather than to the County or to the State. Schools are funded in several ways: through the State Office of Education, through local taxing power, and through special grants and projects.

University/Eastside Community Collaborative (UECC). UECC works with at-risk students in the Riverside Unified School District, particularly on the city's Eastside. UECC staff provide assistance with school work and extracurricular activities of the students. UCR students serve as mentors and tutors. UCR departments hire Eastside students to work after school and in the summer. Three Eastside schools participating in the UECC are part of this pilot project.

CitrusNet. CitrusNet is a network to serve the Inland Empire, primarily promoting Internet access to information for businesses, the public, and private agencies, educational institutions, and local residents through providing electronic connections. CitrusNet has said about electronic resources, "A school without walls, government at the fingertips of its citizens, and local businesses connected to global customer bases; [these] are components of the CitrusNet vision". [14]

Public Libraries - City and County. Public Libraries are the last regional agencies to be brought into this project. This involvement will occur in Phase III as students, teachers, and parents begin to explore more widely the use of the World Wide Web and seek out additional electronic workstations to enhance their personal and school availability. Who are the Schools which will be in the Pilot Project?

Thirteen schools have been selected. They represent two counties, San Bernardino and Riverside. (See Appendix C for listing.) They are in the districts of five California State Legislators and three State Senators in Sacramento, and in the districts of three Representatives to the United States Congress. They are in diverse economic, cultural, and geographic regions of the Inland Empire. But they have the following in common: in order to be selected to be part of the pilot project, each school needed to meet the following criteria:

- Be in an interested school district.

- Be committed to the use of the Internet.
- Have a principal which favors the project.
- Have a "driving force" in the school which understands the value of potential use of the Internet as an educational tool.
- Not be already fully wired and functional on the Internet, but have the capability of becoming wired and functional during the pilot project period.
- Be in the region of UCR student recruitment.
- Be close enough to UCR to get there and back in one day's travel.
- Contribute to the mix of types and sizes of schools.

In addition, each school is expected to accept the following responsibilities:

- To provide additional Internet sites at the school as necessary after the preliminary site is chosen and wired.
- To allow adequate time for teachers to access the Internet and utilize its resources to prepare for instructional use.
- To identify a primary liaison to represent the school in project planning and assessment, allowing sufficient time for adequate participation.
- To empower a representative group of teachers and classes to seek effective uses of the Internet in classroom curricula and computer lab work, and to assess these uses and the reasons for their greater or lesser levels of success.
- To provide strong support from the administrative officers of the school and its district for the school's participation in the project.
- To provide facilities for hosting one or more meetings of the project liaisons during the project.

In return, UCR has accepted the responsibility to provide:

- No expectations for the same standard outcome for each of the thirteen schools, realizing that the application of Internet resources into the curriculum in the school might vary both in intensity and pace.
- An introduction to the Internet for interested school and district personnel, and training for its use for appropriate teachers or technologists who don't otherwise have access to such training.
- Technical advice on connection to the Internet.
- Assistance and advice in fund-raising to meet the connection costs.
- UCR Library privileges for teachers from the project schools, for the duration of the project.
- Access for teachers and students in the project schools to MELVYL, the University's system-wide library catalogs and database gateway. Pending negotiations with database publishers, this access will also include many databases, including some with full texts of articles and images, which are otherwise restricted to UC students and staff.
- A state-of-the-art computer for the school's library, which can provide Internet service and also function as a server for a school network and Internet host site.
- An expert Library staff member who will serve as liaison to the project schools, an Internet trainer, and a resource person for school teachers using the UCR Library and its instructional resources.

- A World Wide Web site, housed on INFOMINE's server, to serve as the host site for the project.

What are the Challenges for this Pilot Project?

1. To secure sufficient funding. Pilot projects cost money. Some sources which are being investigated include the following:
    - Local allocations of discretionary funds for the installation of infrastructure and additional workstations.
    - UCR Campus commitments to provide technological expertise and initial workstations.
    - Community support with assistance from UCR's Office of Governmental and Community Relations.
    - Grants from U.S. sources such as the National Science Foundation and the National Endowment for Education. Grant-writers are being employed to assist in this effort.
2. To introduce technological change. The University Library as the initiator of this project has been perceived as the "change agent," which in some sectors is a positive attribute, and in others a frightening one, as the project attempts to balance scarce resources as well as changes to the fundamental patterns of school curricula, with the excitement and well-accepted trend toward electronic access to information.
3. To achieve some associated goals. The University has two other goals for this project. One is to provide a positive awareness of the campus as a place to continue education. The second is to increase availability to the Internet to additional schools after the Pilot Project. Both of these goals will take years to implement and evaluate.

Conclusion

INFOMINE continues to distinguish itself and its creators as one of the most appropriate developments for the provision of a flexible and relevant frontend to the Internet world of information. As a virtual library of electronic resources, it will continue to serve its initial clientele - the faculty, students, and researchers of the University of California system. With the development of a new homepage for K-14 resources, INFOMINE has entered a new phase of development, which will include resources specifically added for a non-"primary" clientele. INFOMINE will be pivotal for the University's ongoing commitment to be relevant to a wider clientele.

Joint projects such as the Pilot Project are breaking down the barriers in the educational process and promise to build a continuum of collaboration and educational success among its participants. Everyone in the pilot project, or those who are stakeholders in this project, agree on the fact that the future of education is based upon the unification of interests on the part of the myriad of state and local governmental agencies, elected officials, school districts, and the University itself. The challenges are great, but the potential outcome - better education for all students and an increased positivity toward higher education by students in the pilot region - has encouraged the participants in this project. Evaluation of the project will be conducted as an ongoing part of the project, and at its conclusion. Success will be

measured on many different levels, not the least of which will be whether other school systems and universities model this project.

Appendixes

Appendix A *Sample Record on INFOMINE*

Appendix B *INFOMINE Homepage*

Appendix C *List of Schools Participating in the Pilot Project*

Banning High School
100 W. Westward, Banning, California 92220
Banning Unified School District
Riverside County

Cahuilla Desert Academy
82-489 Avenue 52, Coachella, California 92236
Coachella Valley Unified School District
Riverside County

Fontana A. B. Miller High School
6821 Oleander Ave., Fontana, California 92336
Fontana Unified School District
San Bernardino County

Highland Elementary School
700 Highlander Drive, Riverside, California 92507
Riverside Unified School District
Riverside County

Hyatt Elementary School
4466 Mt. Vernon Drive, Riverside, California 92507
Riverside Unified School District
Riverside County

Mira Loma Middle School
5051 Steve Street, Riverside, California 92509
Jurupa Unified School District
Riverside County

Mission Middle School
5961 Mustang Lane, Riverside, California 92509
Jurupa Unified School District
Riverside County

Mt. San Jacinto Community College
1499 N. State St., San Jacinto, California 92383; and
28237 La Piedra Rd., Menifee, California 92355

Mt. San Jacinto Community College District
Riverside County

Paloma Elementary School 42940 Via Rami, Temecula, California 92593 Temecula
Valley Unified School District Riverside County

Rubidoux High School
4250 Opal St., Riverside, California 92509
Jurupa Unified School District
Riverside County

San Bernardino High School
1850 N. E St., San Bernardino, California 92405
San Bernardino City Unified School District
San Bernardino County

Sherman Indian High School
9010 Magnolia Avenue, Riverside, California 92503
Bureau of Indian Affairs
Riverside County

University Heights Middle School
1155 Massachusetts Ave, Riverside, California 92507
Riverside Unified School District
Riverside County

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Acronyms and Abbreviations

C++	Computer programming language for user-interface functions such as searching, displaying the table of contents, adding and editing resources on INFOMINE.
CERC	California Educational Research Cooperative.
CERN	European Center for High-Energy Physics (Geneva Switzerland) (Conseil Europpeene pour la Recherche Nucleaires).
CORNET	County of Riverside InterNetwork
CTEI	Comprehensive Teacher Education Institute
GIS	Geographic Information Systems
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
IGIP	Internet Government Information Project

K-12	Kindergarten through Twelfth Grade of School, also known as Elementary and Secondary School.
K-14	Same as above, but also including the next two years of higher education, usually taken at a 2-year community college.
LCSH	Library of Congress Subject Headings
mSQL	Mini Structured Query Language, computer language which provides user interface to relational database management systems.
PERL	Practical Extraction and Report Language
RCOE	Riverside County Office of Education
UC	The University of California
UCR	University of California, Riverside
UECC	University (UCR) Eastside Community Collaborative
URL	Uniform Resource Locator code used to specify an "object" on the Internet, and is often used on the WWW in HTML documents to hyperlink to the resource.
WWW	World Wide Web

Biographies

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