
IUPUI University Library
Information Systems Plan Project

Systems Integration Master Plan:

Realizing the Vision

January 31, 1990

Ameritech Information Systems

We are privileged to live during an extraordinary time. It is the turning of an era. The world is in passage from the industrial age to the information age. This is a time of profound changes, in which the key economic resources in the world will no longer be capital, labor, and raw materials, but rather knowledge, individual innovators, and information.

Technologies which are emerging today will give us the ability to explore, convey, and create knowledge as never before. This has enormous implications for us as individuals, as well as for our institutions. Our colleges and universities will take on especially heavy responsibilities as we make this transition.

We have an opportunity that is given only to few generations in history. I believe that if we respond with our best creative energies, we can unleash a new Renaissance of discovery and learning. (John Sculley, The Relationship Between Business and Higher Education: A Perspective on the 21st Century, Communications of the ACM, September 1989)

The quote conveys the importance and the excitement of the new IUPUI University Library project. A summary version of the three-volume Information Systems Plan, this report describes the vision, the architecture, and the implementation plan for the electronic information systems that the new Library will use in supporting IUPUI's "new Renaissance of discovery and learning."

IUPUI University Library Information Systems Plan

Table of Contents

1.	EXECUTIVE SUMMARY	1
2.	THE VISION	3
3.	THE REALIZATION OF THE VISION	7
4.	IMPLEMENTATION STRATEGY AND SCHEDULE	13
4.1	Project Descriptions	13
4.2	Project Schedule	14
5.	CRITICAL SUCCESS FACTORS AND RECOMMENDATIONS	16
6.	SUMMARY OF COSTS AND BENEFITS	17
6.1	Benefits	17
6.2	Costs	19

1. EXECUTIVE SUMMARY

"Probably the single most important project aimed at ensuring unity of academic purpose at IUPUI is the University Library, the physical statement of a university's highest values and aspirations. It is to become the physical and symbolic centerpiece of IUPUI as the ideal university of the next century." (IUPUI by the Year 2000: Extending the Promise, 1989)

Expected to open in 1992, the new Library will employ state-of-the-art electronic information systems technology to serve students, faculty, staff, and Indiana businesses and residents.

Planning of those information systems is proceeding in parallel with the building design. The three-volume Information Systems Plan includes:

- A description of the current information systems
- The requirements for the future Library systems environment
- A conceptual architecture of that future integrated environment
- An implementation plan describing the projects, costs, benefits, schedule, strategies, and organization required to implement the new Library's information systems

As shown in Figure 1, the new Library will be at the center of a network of networks. Patrons will use advanced workstations as vehicles through which to navigate networks to access repositories of data, information, and knowledge throughout the world. The workstations will support integration of data, video, and audio media. A Gateway will provide increasing transparency of access, shielding users from the complexities of the diverse systems. The workstations will also be workbenches on which users will be able to manipulate data, transforming it into scholarly knowledge.

The hardware, software, and development effort for the new Library information systems is expected to cost about \$14 million. This expenditure will make a major contribution to the quantity and quality of IUPUI scholarship and also to IUPUI's position in the imminent information-intensive world of the twenty-first century.

IUPUI has a multifaceted, challenging mission within Indianapolis and Indiana. Through technical innovation and a service perspective, the new Library is essential in the fulfillment of that mission.

IUPUI University Library Information System Architecture Conceptual Model

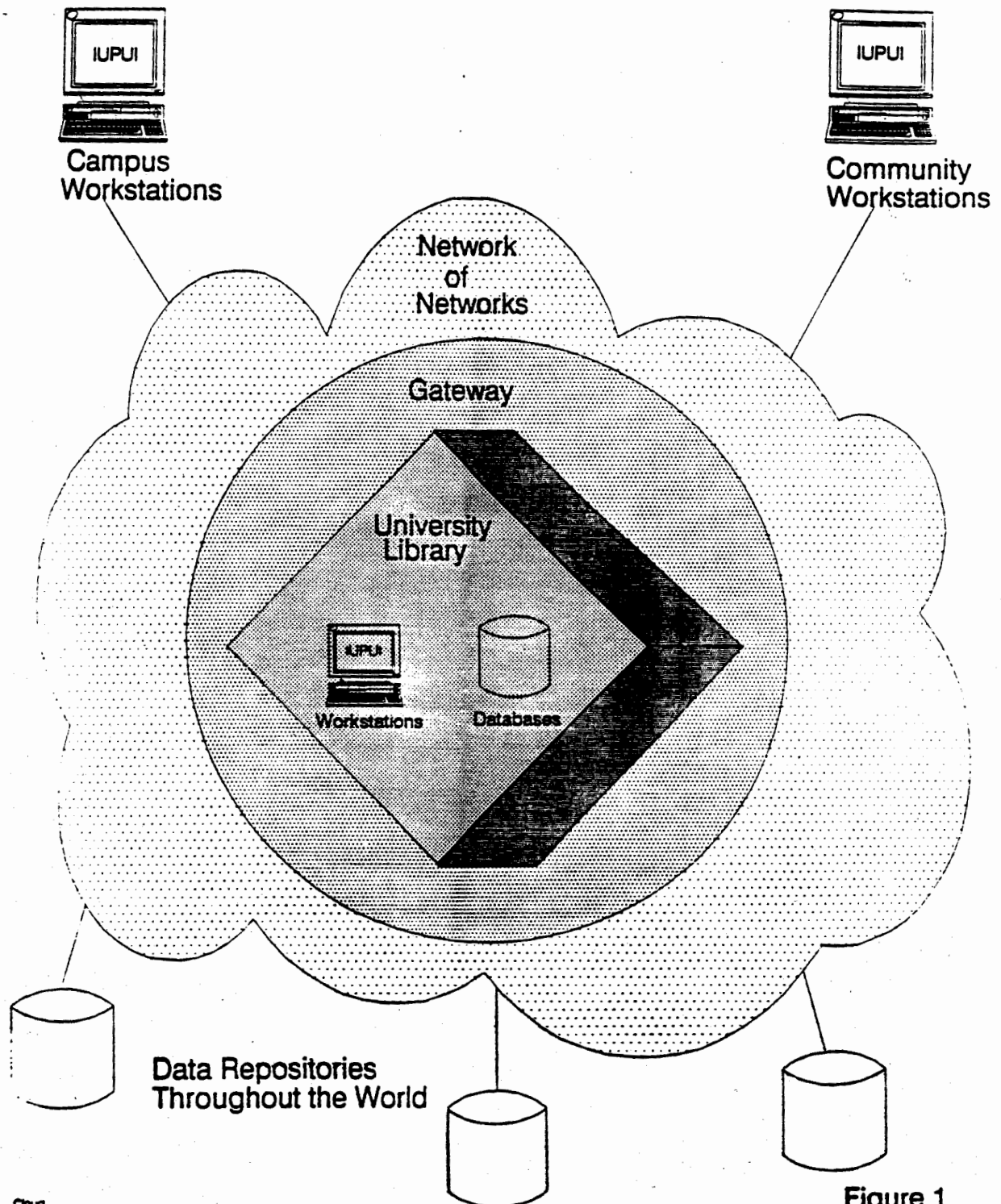


Figure 1

2. THE VISION

Background

In 1984, the University Libraries Development Task Force was established. Its mandate was to examine the IUPUI University Libraries' needs concerning collection development, resource sharing, facilities, staffing, and automation of services and to draft a plan for remedial action and long-term development. Their evaluation indicated that the University Libraries collection, staffing, and physical facilities were seriously deficient.

The Task Force's development plan recommended the construction of a new IUPUI University Library building which would:

- Incorporate the Science and Engineering Library
- Reflect urban campus needs
- Utilize state-of-the-art library automation
- Accommodate a substantial expansion of the collection

These recommendations were accepted and the resulting initiatives are now under development. With construction to begin this year and to complete in the late summer of 1992, the new IUPUI University Library will have 186,594 assignable square feet. It will be located on the IUPUI main campus east of the Business/SPEA and Education/Social Work Buildings and west of Buildings II and III of the Science, Engineering and Technology complex.

A related initiative is the Statewide University Library Automation Network (SULAN). In association with SULAN, the Indiana University (IU) system and Purdue University have each undertaken the implementation of the NOTIS integrated library information system. The Indiana University library system is called NOTIS/IO (Information Online). In September 1989, the IUPUI University Library became the first IU system library to begin cataloging on NOTIS/IO.

The new Library is integral to the *IUPUI Development Plan: 1988 - 2000* which documents the plans and aspirations of IUPUI through to the year 2000. The four themes in the Plan- Continuation, Completion, Consolidation, and Cooperation, are woven through the development concept for the new Library.

The Development Concept

In the millennia since the Library of Alexandria, libraries have evolved gradually using emerging technologies such as the printing press and third-generation computer systems. Today, libraries are on a new threshold of unprecedented change. The dramatic synergy of information systems, storage, and communications which will continue to occur over the next twenty years will bring revolutionary advances in library concepts and services.

As Francis Bacon stated in 1597, information is power. The twenty-first century will belong to the people who can access, assimilate, and use information. The objective of this project is to use technology to reshape our learning environment by providing enhanced access to data and tools, and to develop information skills in our students.

In achieving this objective, the new IUPUI Library will be:

- **A visible symbol of unity and excellence for the University.** Given the critical nature of a library in the performance of an educational institution, the construction of this new University Library is considered to be one of the most important projects aimed at ensuring unity of academic purpose at IUPUI.
- **The centerpiece of a coordinated support system for scholars** involving the library, computing services, telecommunications, and learning technologies
- **A paradigm for learning centers of the twenty-first century.** The Library will be much more than a place where books and other print materials are stored and used. It will be a learning center where students, faculty, and citizens gain access not only to materials, but to each other. Electronic tools for organizing and creating knowledge will also be available.
- **Outwardly-oriented.** The new Library will connect to external information sources. Also, it will provide services outside the new building. The learning environment will be extended into the home. For example, students and faculty will be able to access Library systems from their home computers.
- **A major community resource for Indiana residents.** It will offer and bring to reality a stronger linkage with the community. IUPUI will play an ever-increasing role in the state's economic growth, perhaps as the center of a knowledge-based brokerage system.

- **The center for specific resources vital to economic development.** As such it may prove to be the single most important community resource in the year 2000 as service industries and a burgeoning not-for-profit sector cope with an avalanche of new information. The new Library will function as an information resource for state businesses, especially those in the IUPUI/Indiana University/Purdue research triangle area. It will become a nerve center for information-dependent public and private sector agencies. The Library will provide an information base for entrepreneurs. For example, an Indiana business planning to market its product in Europe may use the Library to exploit databases containing European market data.
- **A center for information services throughout the state.** The new Library will serve as administrative headquarters for the SULAN statewide library automation system intended to link state college and university libraries and, eventually, all private and public libraries in Indiana. This will enable users to access electronically any of the Indiana library catalogs.

These objectives are reflected in the *University Library Building Program* which states:

The Library Project proposes a building unique among academic buildings on the campus by the extent to which it will bring technology into the everyday life of IUPUI students, faculty, and staff:

The University Library will employ technology to serve the Library patron, to enhance the library collection, and to increase the efficiency and effectiveness of its staff. IUPUI Libraries will be fully networked with Indiana and Purdue Universities throughout the state.

. . . The Library patron will have available many individual study stations equipped to access information in a variety of formats - computer-based, microform, video cassette and disk, as well as the traditional paper-based. Stations not already equipped for advanced technologies will be capable of receiving such equipment with a minimum of adjustment.

. . . The collection will, as much as possible, be expanded in technologically-advanced and ultimately space-saving formats. Periodicals, government documents, and reference tools are expected to be the first parts of the collection to experience significant development in alternative formats.

. . . Library staff will work with new technologies on a routine basis. Each librarian and staff member will have a fully-equipped workstation

enabling him or her to communicate electronically, to access the online catalog and other databases, to do word and data processing, and to assist in acquisition, processing, and circulation of library materials.

[The Library, with support from Indianapolis Computing Services and the Office of Learning Technologies,] will use technological advances in video, telecommunications, computing networks, graphics, and electronic distribution systems planned for the new building to enhance the processing and distribution of information on the IUPUI campus.

... The Library is expected to become a national model for libraries of the future - scholarly information centers which will serve an increasingly diverse clientele in highly flexible and innovative ways.

Building construction must parallel, and interrelate with, information systems development. Form follows function. The building is form; the information systems are the function. The electronic functionality will allow the Library to transcend its physical limitations.

The Information Systems Plan

The information systems for the new IUPUI University Library must take into account the emerging trends in technology and information storage and retrieval. To carry out its mission successfully, the new Library must be in the forefront of these endeavors and move into the twenty-first century as an information utility in a very dynamic period in the development of information technology.

With architectural design of the new IUPUI University Library underway, attention is also being given to the architecture of the new Library's electronic information systems. In that regard, an Information Systems Plan has been developed which:

- Describes the requirements for the Library systems
- Identifies the systems which will be needed
- Has established a conceptual technical architecture within which those systems will function
- Includes an integrated implementation plan for the various projects which will construct the new Library information systems environment. Included are costs, benefits, priorities, and a schedule.

3. THE REALIZATION OF THE VISION

"This is the time of the information revolution. No institution in society is more deeply and intimately involved in information than is the library. The information revolution is one of the outcomes of the computer revolution.

... No activity has more of its functions affected by the computer than has the library. No institution is more deeply involved in the information revolution than the library." (Harvey Wheeler, The Virtual Library, 1987)

The Information Systems Architecture

The Information Systems Plan includes a conceptual architecture for the new Library information systems. This architecture consists of an **integrated** arrangement of computer hardware, communications networks, databases, and support structures.

The following are the key elements of the architecture:

- **Workstations** - the Library information systems will enable patrons and staff to use intelligent workstations as vehicles through which to navigate a network of networks accessing repositories of data, information, and knowledge throughout the world. The workstation will also be a workbench on which a user will be able to manipulate data and information, transforming it into scholarly knowledge.
- **Multi-Media** - In addition to traditional paper media, the new Library will integrate data, video, image, and audio media.
- **Network of Networks** - The Library network will be a member of a network of networks. It will be connected to the Campus Network that will be connected to many other networks on and off campus. For example, Indiana University-Bloomington provides IUPUI with access to the Internet via CICNET, that in turn is connected to NSFNET. The continued growth of this network of networks provides the Library with expanding opportunities to service patrons outside the Library and provide access to materials outside the Library. These opportunities will become more significant with the continued dramatic growth in telecommunications bandwidth and decline in costs.

- **The Gateway** - This system will provide increasing transparency of access, shielding the user from the complexities of the network and the many system interfaces.
- **Databases** - Data is the basic product of a library, and the content and structure of the Library's databases shall be important to the success of the new Library. The network will provide access to data, information, and knowledge databases. The databases will reside on IUPUI computers, CD ROM systems in the Library, and on remote computers.
- **Support** - The Library's applications, databases, and technology platform will require a sophisticated support organization for their development, operation, and maintenance. The support infrastructure will consist of functions, policies, organization, and human resources. Division of responsibility for the support infrastructure will need to be jointly determined by the participating organizations: University Libraries, Indianapolis Computing Services, Office of Learning Technologies, Telecommunication Services, the NOTIS/IO support organization, SULAC, and others.
- **Phased Approach** - The new Library's systems will be developed in phases. Development will be ongoing during each phase. The level of integration and sophistication of the systems will be continually evolving with the introduction of new technology. The pace and extent of that evolution will depend on funding and technology availability. The major milestones will be:
 - Phase I begins at the conclusion of this planning project and concludes when the new Library becomes operational. In other words, Phase I will be the initial information systems platform for the new Library. There will be some consolidation of user interfaces and access transparency. Integration of video and data media will be at an early stage.
 - Phase II will begin at the completion of Phase I and will conclude in 1997. The systems will have enhanced integration, connectivity, and transparency.
 - Phase III will begin at the completion of Phase II and is intended to be a highly futuristic vision. There will be complete integration of user interfaces, applications, networks, media, and databases.

The Technology Platform

"Technology has the potential for being a catalyst for the transformation of the educational process in America." (Jim Dezell, Vendors' Summit '88, Electronic Learning, February 1988)

As shown in the Conceptual Architecture diagram in Figure 2, the Library applications and databases will operate on a Technology Platform consisting of devices interconnected by various networks. The devices will include workstations, file servers, print servers, and host mainframe computers. The network of networks will be a hierarchy: a Library Network consisting of an Ethernet Local Area Network and a Video Network, the Campus Network, and various external networks, including the Statewide University Library Automation Network.

The design of the architecture presented many challenges, but the principle challenge was to provide a *natural, seamless library information environment* for IUPUI students, faculty, and staff. A natural systems environment is one which is intrinsically easy to use; the command structure is clear and the technical complexities are masked from the user. Patrons and staff should not see a "seam" when moving from one system to another. The systems should appear as one large, integrated system.

Another important concept in the design is the client/server architecture. The workstations are client devices that will request various services from devices that provide file storage, network access, and printing. Despite the growing trend towards maintaining information in an electronic form, paper will remain an important medium for many years.

Patrons and staff will access Library systems via their workstations. A key architectural requirement is having sufficient interoperability to accommodate a wide variety of workstations when the Library opens and an even wider variety as workstation technology changes. Today's state-of-the-art workstations will be obsolete by 1992. Processors will become faster, memory and storage capacity will expand, and displays will improve in quality and resolution. During the lifetime of the new Library, workstations will continue to evolve dramatically.

ASUNT

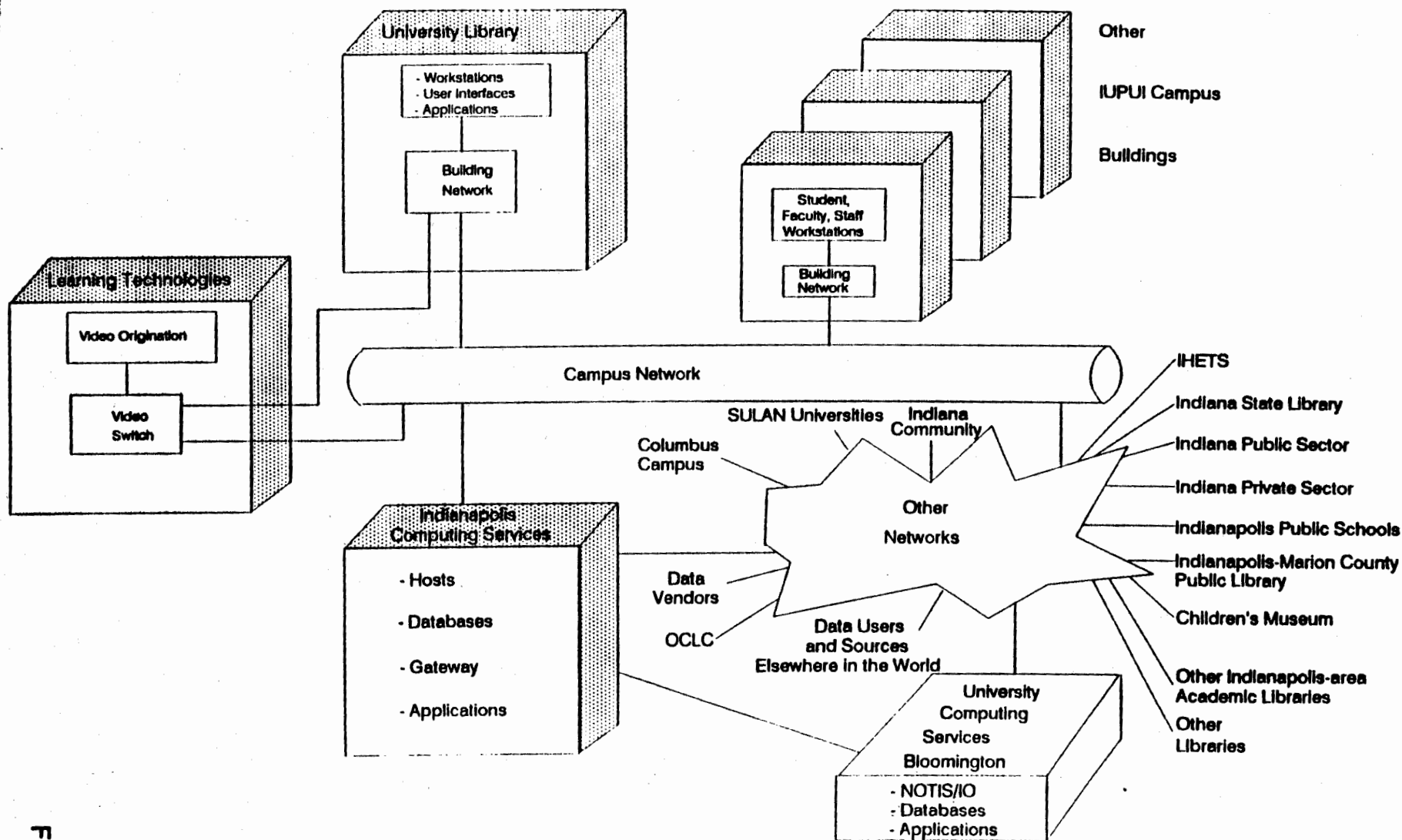


Figure 2

Conceptual Architecture

A Scenario

The following is a "real-life" scenario intended to give the reader a user perspective of the planned systems:

The new University Library has just opened. Elisa, a business student in her first year at IUPUI, has been given an assignment to write a paper on the Indiana economy.

*She visits the reference area in the Library for advice on how to use the Library resources. The reference librarian starts by showing her how to initiate the tutorial session on a **carrel workstation**. Based on a **database of databases**, Elisa is also referred to the following databases for background information:*

- *The NOTIS/IO Information Online catalog containing all computerized catalog records for items in the Indiana University system libraries*
- *A related database which is mounted on the Indianapolis Computing Services (ICS) IBM 3090 mainframe computer*
- *The NEXIS newspaper article remote online database*
- *The EDIN/STATIS database*
- *Certain CD ROM databases containing full-text articles on economics research*

*The reference librarian also gives Elisa assistance in formatting the commands for her query. The first two databases use a common **search language**, but the last three databases are all unique.*

After going through the tutorial, Elisa is pleased to see how easy the system is to use, and signs on to NOTIS/IO quickly via the graphical user interface. Using NOTIS/IO, Elisa locates three relevant books and one videotape: one book located at the University Library and which the system indicates is in the stacks, another which is charged out, and the third book is in the Indiana University-Bloomington collection. On her workstation, she requests a loan of the Bloomington book. She also checks the catalogs of several of the SULAN libraries, and requests through SULAN an interlibrary loan of a book from the Purdue library.

Using the full-text database on the ICS computer, she finds and downloads to her workstation several articles of interest. To use the CD ROM databases, she sits down at a networked CD ROM workstation, enters her query, and copies the resulting articles onto a diskette for later reading. At Elisa's request, one of the reference librarians signs

on to NEXIS, does a search, and prints out four related newspaper articles for Elisa. Next, Elisa uses ILIRN to route her to the EDIN/STATIS database where she finds and transfers to her workstation a time series of key Indiana economic statistics.

Upon checking her watch, Elisa decides to leave the Library because she is due at her part-time job in an hour. So, she saves her files on a diskette. Before she leaves, however, she uses ILIRN to request a viewing at 3 P.M. the next day of the videotape from the NOTIS/IO reference.

The next day, Elisa returns to a Scholar's workstation in the Library to initiate videotape playback. The video program appears on the workstation display. Since the workstation is hypermedia-capable, Elisa can type in notes about the videotape, and those notes appear in a "window" on the screen beside the "window" in which the video is being shown.

Seeing that the reference librarians are busy helping other students, Elisa uses the Public Information Display System to see where in the building the first book she was referred to is located. The system shows her the area on the third level where that subject group is shelved. After browsing through the book, she finds some excellent text to quote in her report.

However, there are a few things in the book which she does not understand. So, Elisa sends several questions to her instructor via electronic mail.

Feeling confident about her success in using the Library's new information systems, she approaches the reference librarian to use an OCR scanner which the tutorial session mentioned. In a few minutes, the librarian has scanned the relevant pages and stored the resulting text on Elisa's diskette.

When the Purdue book arrives via interlibrary loan, an electronic notification is transmitted to Elisa's electronic mailbox. She returns to the Library and the Circulation Desk staffperson charges the book out using Elisa's onecard. The card has a barcode which identifies Elisa. A Circulation staffperson uses a laser scanner to read the bar coded ID number and the book barcode, completing the charge out process.

Elisa is pleased about how helpful the Library systems have been in compiling information, but now faces the task of synthesizing her ideas and the accumulated information into a good paper.

She returns to the Library and uses a document processing software package on a carrel workstation to write the report. Elisa utilizes the EDIN/STATIS data to create several graphs in support of her hypotheses. Finally, Elisa prints the report on one of the laser printers available at the Library and goes home, proud of how she has been able to use the Library systems to prepare a more complete and insightful report.

4. IMPLEMENTATION STRATEGY AND SCHEDULE

4.1 Project Descriptions

To construct and integrate the Phase I Library information systems, the following projects will be carried out:

- **Building Wiring Project** - This project will manage the installation of the building fiber optic wiring. Fiber optic cables are considered to be the building telecommunications medium of the future, and will provide the capacity for very high speed data, video, and image transmission within the Library.
- **Workstation Platform (WORKS) Project** - The largest project in the Plan, WORKS involves the specification and installation of the workstation hardware and software.
- **Database Acquisition Project** - Additional electronic databases will be selected and purchased.
- **Gateway Project** - Interface systems which shelter the workstation user from the complexities of the external networks will be developed and implemented.
- **Advanced ILIRN Project** - The existing ILIRN menu system will be enhanced and extended to provide new functions to Library workstation users.
- **Management Information Systems Project** - Given the increased functionality and operating costs of the new Library, management will need tools to monitor resource utilization.
- **Public Information Display System (PUBS) Project** - This project will implement four display systems to be used by patrons in locating resources in the new building.
- **Configuration Management System Project** - A small project, it will implement a system which will provide information on each of the thousands of components in the Library workstation inventory.

- **Chargeback System Feasibility Study Project** - This project will identify policy and systems requirements for a future chargeback system which would allow the Library to recover some of the new information service costs (e.g., computer printing) from Library users.
- **Multi-Media Systems Project** - For all video, audio, and image components of the new Library, this project will specify, acquire, and install the necessary infrastructure (e.g., video playback units, media conversion devices).
- **Support Infrastructure Project** - A new Library Information Systems Unit Head position will be filled. That person will establish the organization necessary to support the operation of the electronic information systems in the new Library.
- **Training Project** - The project will carry out start-up and ongoing training of Library users and staff.
- **External Projects** - These are specified projects which will benefit the Library, but are outside the Library's scope and would be funded and managed by other organizations. For example, there are a number of desirable NOTIS/IO enhancements which may be developed by Indiana University Library in Bloomington.

4.2 Project Schedule

The sequence, schedule, and projected FTE manpower requirements of the planned projects are depicted in Figure 3.

IUPUI University Library Information Systems Plan Project Schedule (Calendar Year)

Project	1990				1991				1992			
	1st Qtr.	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Building Wiring	■	■					■	■	■	■	■	■
Workstation (WORKS)			■	■	■	■	■	■	■	■	■	■
Database Acquisition								■	■	■	■	■
Gateway		■	■			■	■	■				
Advanced ILIRN		■	■	■	■	■	■	■				
Management Information Systems				■	■	■	■	■				
Public Information Display Systems (PUBS)								■	■	■	■	■
Configuration Management System								■	■	■	■	■
Chargeback System Feasibility Study								■	■	■	■	■
Multi-media Systems	■	■	■	■	■	■	■	■	■	■	■	■
Support Infrastructure	■	■	■	■								
Training Project								■	■	■	■	■
Resource Levels												
Development Staff by Quarter (FTE)	2	9	13	14	14	20	24	30	28	26	6	1
Ongoing Support Staff (FTE)	0	0	0	0	0	0	0	0	0	0	14	23

Figure 3

5. CRITICAL SUCCESS FACTORS AND RECOMMENDATIONS

Developing and implementing these projects will be a major undertaking. Proper project control, staffing, project management, and development methodology must be in place.

The remarkable synergy among Indianapolis Computing Services, the Office of Learning Technologies, and the University Library has built a solid foundation for the unique, advanced concepts of the new Library. It is vital that this cooperation continue.

In order to be sufficiently complete when the Library opens in the late summer of 1992, key projects must begin in the first quarter of 1990.

Funding, staffing, and user expectations are strongly interdependent. Variations in any of these three parameters must be reflected in changes to the other two.

Corporate development partners are needed. In return for technology and funding, the new Library can provide them with an advanced development test site and a highly visible technology showplace.

While some system components will be leading edge technology, so-called "bleeding edge" technology is expensive, risky, and should be avoided. Most of the technical components required are already available. The real success of the new Library from the technical perspective will be the extent to which the components are integrated into one large, seamless system.

6. SUMMARY OF COSTS AND BENEFITS

6.1 Benefits

People who do not educate themselves, and keep reeducating themselves, to participate in the new knowledge environment will be the peasants of the information society. And societies that do not give all their people a chance at a relevant education, and also periodic opportunities to tune up their knowledge and their insights, will be left in the jetstream of history by those that do." (Harlan Cleveland, The Knowledge Executive, 1985)

In the competitive world of the information society, the new electronic IUPUI Library will provide these important advantages over traditional paper-oriented libraries:

- Information can be accessed from workstations virtually anywhere.
- Access can be much faster than with paper materials.
- Many different media such as video and audio can be integrated and used.
- Computers can be used for searching and retrieval.
- A much greater volume of information can be made accessible for information mining. An electronic library can act as a filter to help patrons select the most relevant and highest quality information from the growing deluge of published information.
- In the long-term, electronic libraries offer the potential of being less costly than traditional libraries of similar size. The costs of acquiring, shelving, circulating, and preserving paper materials is becoming increasingly expensive.
- Information can be more current. This is especially important in rapidly advancing fields such as engineering.

What are the implications of such a facility to Indiana and to IUPUI and its students, faculty, and staff?

- By providing expanded access to greater amounts of knowledge, information, and data, the Library will improve the quality of education and research at IUPUI. This will increase IUPUI's contribution to Indiana's educational levels and to the world's knowledge base, thereby enhancing IUPUI's standing in the academic community.
- The electronic information environment will serve to attract more and better students and faculty to IUPUI.
- There will be increased community awareness of and reliance on IUPUI as an information resource.
- Similarly, usage of Library facilities by the private and public sectors will benefit those sectors and enhance their relationship with the University.
- The Library will increase the number of personal computers available to students. Increased computer access on campus will allow expanded curriculum opportunities.
- Specialized workstation facilities available at the new University Library will enrich the educational experience for handicapped students.
- Students, faculty, and staff will spend less time on the mechanical aspects of information access. If the Library systems result in an average saving of fifteen minutes per month, say, per student and faculty member, the net saving would be 6,250 person-hours per month (assuming the equivalent of about 25,000 full-time students and faculty). Faculty could spend the saved time on academic activities. Students would presumably spend the additional time on their studies, or, it may simply ease the burden of being a commuting student with job and family obligations.

6.2 Costs

The Phase I Project Cost Distribution spreadsheet shows a summary of one-time and ongoing costs for each project for each fiscal biennium. The following major assumptions have been made:

- The costs are for Phase I projects only. Phase II development would begin in late 1992 and would entail significant expenditures.
- The costs provided herein are **initial estimates** to be used for budgetary purposes only. Actual costs could vary significantly, particularly for later project phases. The software development estimates in this plan are based on only a high-level understanding of the requirements and will need to be refined as part of the project initiation sub-phase of each project. For some projects, the amount of software development which will actually be necessary is still very unclear due to the emerging nature of the technology involved.
- In the project cost distribution spreadsheet, allocations of one-time and ongoing costs across the biennia are highly dependant on the schedule and are subject to variance.
- The Building Wiring Project includes the costs for the data and video building wiring.
- The Multi-Media Systems Project includes Office of Learning Technologies costs for the development, acquisition, and operation of the Library multi-media facilities.
- Because a policy on charging back costs to Library patrons has not yet been determined, chargeback revenues have not been included in the financial model. Those revenues could offset some of the costs.
- These costs are real costs based on the defined systems requirements. Should insufficient funding be available, some of the projects (e.g., WORKS) and their related requirements could be scaled down.

IUPUI University Library Information Systems Plan

Phase I Project Costs

<i>Projects</i>	<i>July 1989 through June 1991 One-Time Costs</i>	<i>July 1991 through June 1993 One-Time Costs</i>	<i>Total One-Time Costs</i>	<i>Annual Ongoing Costs</i>
Building Wiring	\$15,000	\$2,968,600	\$2,983,600	\$1,032,500
Workstation (WORKS)	\$400,000	\$6,192,540	\$6,592,540	\$2,614,053
Database Acquisition	\$0	\$85,440	\$85,440	\$197,040
Gateway	\$250,000	\$403,360	\$653,360	\$86,460
Advanced ILIRN	\$30,000	\$118,378	\$148,378	\$10,886
Management Information Systems	\$0	\$72,070	\$72,070	\$5,040
Public Information Display System	\$0	\$77,800	\$77,800	\$17,840
Configuration Management System	\$0	\$42,320	\$42,320	\$2,300
Chargeback Feasibility Study	\$35,280	\$0	\$35,280	\$0
Multi-Media Systems	\$300,000	\$2,779,320	\$3,079,320	\$1,620,400
Support Infrastructure	\$75,000	\$0	\$75,000	\$102,500
Training	\$0	\$210,000	\$210,000	\$175,000
TOTALS	\$1,105,280	\$12,949,828	\$14,055,108	\$5,864,019

**IUPUI University Library
Information Systems Plan**

Integration Implementation Plan

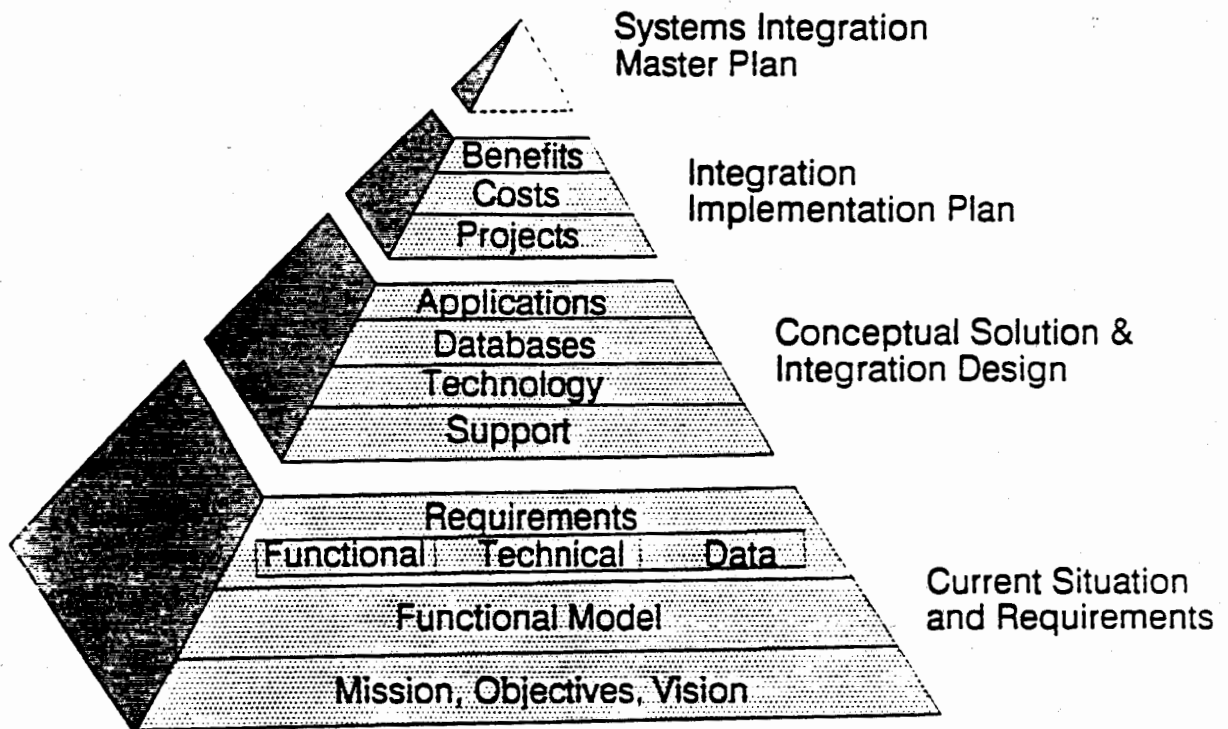
January 31, 1990

Ameritech Information Systems

Table of Contents

1.	INTRODUCTION	1
2.	IMPLEMENTATION STRATEGY AND SCHEDULE	2
2.1	Projects	2
2.1.1	Building Wiring Project	3
2.1.2	Workstation Platform (WORKS) Project	8
2.1.3	Database Acquisition Project	17
2.1.4	Gateway Project	24
2.1.5	Advanced ILIRN Project	28
2.1.6	Management Information Systems Project	33
2.1.7	Public Information Display System (PUBS) Project	38
2.1.8	Configuration Management System Project	41
2.1.9	Chargeback System Feasibility Study Project	45
2.1.10	Multi-Media Systems Project	49
2.1.11	Support Infrastructure Project	53
2.1.12	Training Project	56
2.1.13	External Projects	59
2.2	Project Sequence	61
2.3	Implementation Considerations	63
2.3.1	Global Strategies	63
2.3.2	Funding	65
2.3.3	Development Methodology	66
2.3.3.1	Lifecycle	67
2.3.3.2	Project Control	71
2.3.3.3	Tools and Techniques	74
3.	COSTS AND BENEFITS	75
3.1	Summary of Benefits	75
3.2	Summary of Costs	77
3.3	Priorities	80
	APPENDIX A - GLOSSARY	82

As listed on the right of the figure below, the University Library Information Systems Plan Project has four reports. The major components of this document, the Integration Implementation Plan, are outlined in the second level shaded area of the pyramid. Shaded areas indicate completed reports. The scope of the project covers the electronic information systems of the new IUPUI University Library.



△ Completed Reports

△ Reports Outstanding

1. INTRODUCTION

Thusfar, the Information Systems Plan Project has established:

- The current information systems situation
- The requirements for the future systems environment
- A conceptual architecture of that future environment

The challenge addressed in this report is to create the implementation plan for the future environment. Simply put, the implementation plan describes how to get from "here" to "there". Specifically, it addresses the projects, costs, benefits, schedule, strategies, and organization required to put the Phase I information systems structure into place. Phase I is described in the Conceptual Solution and Integration Design Report.

It is also important for an information systems plan to provide high-level guidance on strategies to maximize the success of the activity resulting from the plan. This is particularly significant for the new Library since there will be many sophisticated, interdependent projects which must be executed concurrently. This is a formidable challenge. The Implementation Plan describes some global strategies, funding strategies, and systems development methodologies to address that challenge.

The hardware, software, and development effort for the new Library information systems is expected to cost about \$14 million. This expenditure will make a major contribution to the quantity and quality of IUPUI scholarship and also to IUPUI's position in the imminent information-intensive world of the twenty-first century.

2. IMPLEMENTATION STRATEGY AND SCHEDULE

The Phase I information systems structure will be put in place by a set of projects. Some of the projects will be interdependent; many will be concurrent. In this section, the projects are described, a high-level project schedule is set forth, and a set of implementation strategies are provided.

2.1 Projects

The projects which will be required to implement the Phase I Library information systems are described in the following subsections. Each description also addresses the benefits, scheduling, staffing requirements, cost assumptions and costs of the project. Some of the projects are relatively independent. Some, such as the WORKS and Gateway project, are highly interdependent and will have to be managed accordingly.

The projects are:

- Building Wiring Project
- Workstation Platform (WORKS) Project
- Database Acquisition Project
- Gateway Project
- Advanced ILIRN Project
- Management Information Systems Project
- Public Information Display System (PUBS) Project
- Configuration Management System Project
- Chargeback System Feasibility Study Project
- Multi-Media Systems Project
- Support Infrastructure Project
- Training Project
- External Projects

2.1.1 Building Wiring Project

Description

This project consists of the effort necessary to participate in the decision-making and to monitor the installation of the telephone, data, and video communications wiring. Security and environmental wiring is excluded from the scope of this activity. Specifically, this project will include monitoring of the following tasks:

- The detailed design of the wiring infrastructure, including component specifications (e.g., type of cable) should be reviewed. It is assumed that HNTB will have developed the draft design and specifications. Because only the Phase I workstations are going to be wired, the wiring design will need to use workstation location information as specified by the Workstation Platform Project (described in Section 2.1.2).
- Provisioning of materials, installation, and testing of the information outlets, conduit, trays, horizontal wiring, termination racks, and risers for data and video communications. The Request for Proposal (RFP) for the project will request alternative cost estimates for fiber and twisted-pair data wiring.
- Design and construction of the telecommunications closets and the computer/switch room
- All cable and terminations are to be documented in the Telecommunications Services cable inventory.
- Responsibility for ongoing data wiring maintenance will be handed over to Telecommunication Services.

Benefits

The building wiring is:

- Probably the single most critical element in the information systems infrastructure
- A complex endeavor
- An effort that spans many areas of responsibility
- The single most costly item in the information systems infrastructure

For these reasons, the building wiring should receive special management attention to ensure its success.

The benefits for this project are:

- The wiring is critical to the operation of most of the Library systems.
- There will be more assurance that the wiring will meet Library needs.
- Costs may be lower due to fewer change orders.
- Future maintenance costs will be lower because of better access to trays and floor sleeves.

Schedule

The review of the detailed design should be done as soon as possible after HNTB has completed the draft design and specifications.

The RFP for the wiring should be distributed at least six months in advance of the building being ready for wiring to begin. This will allow time for the acquisition process, analysis of the fiber versus twisted-pair costs, and time for the vendor to organize and order materials.

Once actual wiring begins, it should take about three to four months to be completed. Trays will be installed before the building lighting is put in place. The wiring itself will be installed just before the wall panels are installed. Information outlets will be installed prior to interior finishing.

Staff Requirements

This will require about four person-months of University Library effort, mostly during the actual installation stage. The Library will need to supply a project manager who has expertise in wiring installation. The project manager should be given some authority to resolve problems.

HNTB, the building engineers, will design the physical horizontal wiring structures. Telecommunication Services will supply staff to:

- Test all wiring (except video)
- Document all wiring

- Termination and cross-connection of the building risers
- Install the external network connections (except video)

The Office of Learning Technologies will supply staff to:

- Test all video wiring
- Establish external video network connections
- Ensure the integrity of all video installations in the new Library

The building contractor will be responsible for the installation of the horizontal wiring structures and the vertical wiring and conduit.

Cost Assumptions

The cost of all wiring in the building is included in the spreadsheet. Some of these costs may be covered within the building budget. It is included here to ensure that adequate funding has been identified. The actual wiring will be carried out by the building contractor or a subcontractor under the control of the University Architect's Office.

Telecommunications Services will inspect, test, and document all building wiring except video.

The wiring estimate is based on the following assumptions:

- The wiring will be in a non-plenum environment.
- The estimate does not include support structures (e.g., trays, conduit, sleeves, plywood backboards).
- No electronics are included here.

- The estimate is intended to include cable and connectors.
- To allow for Phase I devices, some future growth, and widespread access throughout the Library, 1400 information outlets will be installed.
- Each information outlet shall consist of two unshielded twisted four pair, one coax, and two terminated pair of multi-mode fiber (one pair each for video and data). The two pairs of multi-mode will be terminated at the work location and in the telecommunications closets.
- The fiber optic cable will include twelve pairs to allow for breakage and future growth. Most will multi-mode; a few pair will be single mode. All but the two multi-mode pairs mentioned above will be left dark and unterminated at initial installation.
- All risers except for coax are included.

The manpower estimate is based on the assumption that installation of the vertical and horizontal distribution systems will be concurrent. Also, the project manager and the wiring subcontractor must have access to the building as soon as the concrete structure is in place.

The wiring maintenance item is for adds/moves/changes.

**IUPUI University Library – Information Systems Plan
Building Wiring Project**

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Wiring Costs	1	2950000	2950000	0
Replacement costs (15%)	0	0	0	442500
Wiring Maintenance (20%)	0	0	0	590000
Hardware Subtotal			2950000	1032500
Software				
Software Maintenance	0	0	0	0
Software Subtotal			0	0
Communications				
ICS Processing	0	0	0	0
Communications Subtotal			0	0
Human Resources (person-months)				
Project Manager	4	8400	33600	0
Human Resources Subtotal			33600	0
TOTALS			\$2,983,600	\$1,032,500

2.1.2 Workstation Platform (WORKS) Project

Description

The workstations, printers, LANs, and other data devices need to be specified, prototyped, acquired, and installed. Many of the specifications and architectural criteria are listed in the Current Situation and Requirements Report and the Conceptual Solution and Integration Design Report developed earlier in this Information Systems Plan Project.

A large project in itself, the Workstation Platform Project will include the following subprojects. The subproject structure has been created so as to break the overall project into more manageable pieces. However, the subprojects have many interdependencies requiring careful coordination.

- Workstation Subproject
 - It is expected that prototypes of the Scholars Workstation, the Carrel Workstation, and a remote workstation will be developed as part of the analysis phase and prior to acquisition of the workstations. The software developed for these prototypes should not be throw-away; 80% of it should be usable in the production workstation. The prototypes should develop at a high level, or simulate, all major functions of the Phase I workstations. This includes the various menuing levels and connectivity through the Campus Broadband to ICS and other key points on the network including ICS and NOTIS/IO. The prototypes will uncover technical limitations and problems. The prototypes will be "living", evolving, visible representations of the design. They will need to be coordinated with the NOTIS/IO LinkWay development.
 - Included in the prototype will be the development and implementation of any graphical user interfaces. This subproject will have to be coordinated with the Advanced ILIRN Project.
 - The subproject will design, specify, acquire, install, test, and document each of the following workstation types to be installed in the Library. Specifications will include all elements of the workstation, such as workstation models, operating system, manufacturers (in some cases), locations, numbers, monitors, memory, boards, cables, etc.. The project will also provide any required specialized workstation peripherals such as OCR scanners, FAX boards, and bar-code readers. To ensure that specified workstations will support full-motion video display and audio output, the Office of Learning

Technologies members of the subproject team will participate in the workstation configuration design.

Some of the workstations will be replacements of existing ones. Existing workstations which will be moved to the new Library must be identified, as well as the additional components/upgrades necessary to connect them to the new network.

- Scholars Workstations
 - Standard Workstations
 - OCLC Workstations
 - GTO Workstations
 - Carrel Workstations
 - Charge Out Workstations
 - OPAC Terminals or Workstations
 - Any stand-alone hypermedia workstations
-
- LAN Subproject
 - The project will design, specify, acquire, install, test, and document the LAN file servers and print servers to be installed in the Library. Specifications will include numbers, locations, file server capacities, storage capacity, LAN backup, printer speeds and printer functions. Existing printers and servers which will be moved to the new Library must be identified, as well as the additional components/upgrades necessary to connect them to the new network.
 - The project will design, specify, acquire, install, test, and document all hardware, software, and wiring components (e.g., TCP/IP boards, LAN cards, connectors, terminator panels, etc.) necessary to connect all Library workstations to the building network. This includes Library building network management facilities.
 - Campus Network Connection Subproject
 - The project will design, specify, acquire, install, test, and document

all hardware, software, and wiring components necessary to connect the Library building network to the Campus Broadband Network data coax cable. This includes the router or modem/bridge connection device.

- **Workstation Software Subproject**
 - The project will specify, acquire, install, test, and document all workstation application software (e.g., ProCite, ALA character set driver software, TCP/IP and LAN software, document processing, etc.). Also included in this subproject will be any host software (e.g., electronic mail) and setup (e.g., passwords). License options should be investigated (single copy vs. limited-number license vs. site license).
- **CD ROM Subproject**
 - The project will also design, specify, acquire, install, test, and document CD ROM servers, network, workstations, and associated print servers. Assuming that CD ROM technology will not have advanced sufficiently to integrate CD ROM servers within the building-wide network, these devices will be on their own stand-alone network. Therefore, the CD ROM network has unique, additional wiring implications. This subproject will provide the hardware platform to access the CD ROM databases originating from the Database Acquisition Project, and hence will have to coordinate with that project. The investment in CD ROM technology should be limited in view of the uncertainty regarding its viability for IUPUI's long-term database requirements.
- **Handicapped Systems Subproject**
 - Workstations to support the handicapped (e.g., Kurzweil devices) will need to be specified, acquired, installed, tested, and documented. Staff will be trained on the operation of these devices so as to assist patrons. These devices should be based on Library-standardized workstations.
- **Site Preparation Subproject**
 - Site preparation is an important part of this project. The scope of this activity would have to be coordinated with the building construction. For example, appropriate electrical power will need to be provided. Racks will have to be acquired and installed for the telecommunications closet LAN equipment.

An important aspect of this project is the need to establish standards as early as possible in the requirements analysis. For example, what keyboard emulation will be needed?

All workstations and printers installed by this project will be owned by University Libraries. Maintenance for these devices will be arranged by Indianapolis Computing Services.

Benefits

The workstation is a fundamental component of the Library information systems architecture. It will provide students, faculty, and staff access to the electronic information universe. The workstation will be the most visible component of the systems architecture. Most of the architecture will be "hidden" from the user.

The patron workstations will increase personal computer availability for students. This will be particularly valuable to commuting students and students who do not have their own personal computers.

Increased personal computer access on campus will expand curriculum opportunities. For example, there is a mathematics computer-assisted learning (CAL) software package called Mathematica which runs on the Sun workstations. Using the considerable power of the Sun and real-time three-dimensional graphics, students can observe and modify the graphs of sophisticated mathematical equations. This visual display is extremely helpful to mathematical understanding and is just as extremely difficult for an instructor to draw on a whiteboard.

The specialized workstation facilities will expedite and enrich the educational experience for handicapped students.

Schedule

The project is a long one and must begin as soon as possible. It should be conducted in parallel with the building wiring project. Installation of devices, however, cannot begin until the building is nearly ready for the Library to move in. The RFP process and ordering of components should be staggered so that devices are delivered just-in-time to be installed. Some of the key components (e.g., Scholars workstation, LAN server) may be required earlier for prototyping, testing, integration, and training purposes.

There will be some overlap with the Gateway project. The projects should be carried out concurrently, beginning after completion of the Gateway project architecture phase.

A major variable in the schedule is the number of prototypes and prototype environments.

Their numbers must be minimized so as to minimize development and ongoing support costs. It is assumed that there will only be three prototype environments: UNIX, OS/2, and one other. It is also assumed that the application interfaces will be portable between those environments. That is, the key functioning kernel of the workstation software should be platform-independent. For example, it could be written in C language. For every additional platform, at least another three person-months of effort would be added to the development activity. There would also be increased operational support required. To minimize technical complexity, effort, and cost, the number of prototypes and environments should be minimized. Some environments such as MS/DOS will function in both stand-alone mode and as a UNIX shell. Assuming that 1992 workstations have capacity at least equivalent to a 80486 processor, MS/DOS performance as a UNIX shell will be roughly the same as on a current 80386 processor.

The specific prototypes to be done should be defined at the start of the Analysis/Design Phase. Potentially, there could be as many as 96 different variations of the prototypes. This number (4 X 4 X 6) is based on four different user environments (staff, patron in library, campus, and off-campus), as many as four different operating systems environments (UNIX, OS/2, MS/DOS, and Macintosh), and six different workstation types (Scholars, Standard, Carrel, Charge Out, Handicapped, and OPAC). Obviously it is not practical to develop this many prototypes or to support that many variations. The range of possibilities will have to be reduced, and the prototypes selected so that their usefulness will span as many user environments and workstation types as possible. The prototypes should start with the Scholars Workstation. Subsequent prototypes would be functional subsets.

Technical and user prototyping should be used throughout the Analysis and Design phases. The technical prototype will test technical aspects of the leading edge workstation/gateway functionality. The user prototype will be useful to human-engineer the user interface. The initial user prototypes should be based on quick, simple-to-use software so as to maximize the speed of the prototyping process. The initial prototypes will be used primarily to confirm the look and feel of the user interface. They will probably be throw-away. Subsequent generations of the prototypes should be based on production software (e.g., LinkWay) and should be usable in the operational version of the system.

The Analysis and Design phases will be combined because of the prototyping approach to be used. The combined phase will generate the system specifications and the RFP(s) for the equipment. The RFP(s) should be due about 3 weeks from issuance. Selection will take about two months. Contracting will take an additional 2 months. However, it may be possible to acquire many of the items through existing supply channels.

The Development and Implementation Phases should also be combined since there will be little actual development. The effort will involve receiving components, installing them, assembly and integration of the various hardware and software components, connecting them to the building network, and system testing.

Phase	Duration
Analysis/Design	10 months
Development/Implementation	12 months
Total	22 months

Staff Requirements

The project will be a joint project, with a multidisciplinary team from University Libraries, Indianapolis Computing Services, and the Office of Learning Technologies. It will require a project manager, three senior analyst/programmers, a Design Engineer, a human interface design consultant, three programmers, and three technicians as specified in the costing spreadsheet. Each senior analyst/programmer should be assigned responsibility for one or more of the subprojects.

Also, considerable assistance will be needed from IUPUI purchasing, legal, and accounting support agencies to handle the purchasing, contracting, and payments.

Cost Assumptions

The numbers of the various workstation types is as documented in the Wiring Committee Report.

Appropriate boards, software, and connecting cables will be needed to connect existing workstations to the network.

The costs for each workstation, printer, and other device include all necessary boards (e.g., TCP and Ethernet) and cables to connect them to the building network or workstation as appropriate.

Workstation supplies are estimated at \$100 per year each. Printer supplies are estimated at \$480 per year each.

CD ROM workstations will have the same configuration as carrel workstations except that the former will have a hard disk and only one floppy disk drive.

The Network Interface Unit has been budgeted using the cost of a Syscon router.

Only additional hardware is included here; some existing hardware will be moved in from the old Library.

Some staff will have a direct-attached dedicated printer in their office. All laser printers will be network-attached.

Each charge out workstation will have a 3287 direct-addressable printer for receipt printing.

There will be one OPAC printer for every 2 OPAC workstations.

There will be about 25 workstations and printers per LAN server.

The handicapped equipment includes two fully-configured Kurzweil personal readers, two speech recognition workstations, and two electronic image magnification systems.

With five floors, two telecommunications closets per floor and six racks per closet, 60 racks will be needed.

Except for specialized, limited distribution software, most package software will be on a site license basis.

Indianapolis Computing Services provides electronic mail facilities and campus and off-campus data communications (except for dedicated lines and long-distance dial-up) to the Library at no charge. It is expected that all Library staff will be using PROFS electronic mail. There will be no charge to the Library for Internet usage.

No additional costs are included for workstation physical security. Physically attaching workstations to the carrels will void the warranties. The campus experience has been that there has been little theft of or vandalism to installed workstations.

There is no charge to the Library for usage of NOTIS/IO. The University has also committed to provide replacement funds for NOTIS/IO hardware. The OCLC GTO wiring item is for the RS232 cabling to connect the OCLC workstations to the GTO workstations. The two GTO workstations will be in addition to existing GTO workstations. Run-time versions of LinkWay are available for the cost of the media because they are covered by a site license.

About three workstations will share each OCLC modem. INCOLSA subsidizes OCLC telecommunications line costs. The OCLC usage costs listed include cataloguing charges and interlibrary loan costs. They are in addition to the present OCLC usage costs.

IUPUI University Library - Information Systems Plan

Workstation Platform (WORKS) Project

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Workstations:				
Scholar's Workstations	52	15000	780000	
Std. Staff Workstations	125	7500	937500	
OCLC Workstations	10	2300	23000	
GTO Workstations	2	4000	8000	
Carrel Workstations	312	6100	1903200	
Charge Out Workstations	9	3500	31500	
OPAC Workstations	60	1500	90000	
CD ROM Workstations	45	2500	112500	
Hypermedia Workstations	2	15000	30000	
Kurzweil Devices	2	12000	24000	
Kurzweil Speech Recog. WS	2	15000	30000	
Workstation Count	621			
Printers:				
Laser Printers	20	2000	40000	
Staff Printers	65	600	39000	
Carrel Printers	90	600	54000	
OPAC Printers	30	600	18000	
Charge Out Printers	9	1500	13500	
Printer Fiber Optic Boards	119	200	23800	
Printer Count	214			
Network Equipment:				
LAN servers	26	25000	650000	
Terminal Servers	1	34000	34000	
OCLC Modems	5	400	2000	
CD ROM Servers	3	23000	69000	
Network Interface Unit	1	20000	20000	
Network Mgmt. System	1	29000	29000	
OCLC GTO RS232 Wiring	17	500	8500	
Other Equipment:				
High-end OCR Scanner	1	20000	20000	
Low-end OCR Scanners	85	1500	127500	
Other Handicapped Devices	2	3000	6000	
High-end Facsimile Machines	2	5000	10000	
Low-end Facsimile Machines	3	2500	7500	
Racks	60	1150	69000	
Replacement costs (30%)			0	1563150
Hardware Maintenance (10%)			0	521050
Site Preparation	1	30000	30000	
Hardware Subtotal			5240500	2084200

**IUPUI University Library – Information Systems Plan
Workstation Platform (WORKS) Project (cont.)**

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Supplies				
Printer Supplies	214	0	0	102720
Workstation Supplies	200	0	0	20000
Supplies Subtotal			0	122720
Software				
Workstation	493	1300	640900	0
NOTIS GTO	2	0	0	0
Electronic Mail	0	0	0	0
Software upgrades (25%)	0	0	0	160225
Software Maintenance(12%)	0	0	0	76908
Software Subtotal			640900	237133
Communications Charges				
OCLC Lines	5	100	500	10000
OCLC Usage	0	0	0	10000
Communications Subtotal			500	20000
Human Resources (person-months)				
Analysis/Design Phase:				
Project Manager	10	5040	50400	0
Lead Analyst/Programmer	25	5040	126000	0
Programmers	25	5040	126000	0
Technicians	10	5040	50400	0
Design Engineer	1	5040	5040	0
Human Interface Consultant	1	5040	5040	0
Development/Implement Phase:				
Project Manager	8	5040	40320	0
Lead Analyst/Programmer	30	5040	151200	0
Programmer	10	5040	50400	0
Technician	20	5040	100800	0
Design Engineer	1	5040	5040	0
Ongoing Support:				
Technicians (3FTE)	0	0	0	75000
Student Consultants (3FTE)	0	0	0	75000
Human Resources Subtotal			710640	150000
TOTALS			\$6,592,540	\$2,614,053

2.1.3 Database Acquisition Project

Description

To an ever-increasing degree in the 1990s, Library materials acquisition will involve electronic rather than paper materials. Electronic databases typically contain information equivalent to hundreds of books or journals. They also entail substantial expenditures. For these reasons, the selection of electronic databases will assume greater significance and will merit proportionately more attention than the selection of individual volumes or journals.

The Library must carefully research its database acquisitions to avoid having unnecessarily redundant databases and to ensure that the wide variety of patron needs are met by the databases selected. This Database Acquisition project will:

- Determine the campus detailed requirements for databases in specific academic areas.
- Analyze data access requirements. For example, given the volume and nature of access, should the Library subscribe to a remote, online database for certain information, or, should it implement a local CD ROM system to provide that information? Some databases will be locally-mounted at Indianapolis Computing Services.
- Select which databases to acquire or subscribe to. This will require coordination with the other libraries within the IU system to avoid unnecessary database duplication. It may be necessary to acquire multiple copies of some CD ROM databases due to high access demand.
- Implement the recommended databases.
- Ensure that the Library does not subscribe to multiple databases containing the same type of information.
- Ensure that the Library gets a high degree of access to a wide array of data for the least expenditure.

The project will consist of two phases:

- **Analysis/Design Phase**

In this phase, each IUPUI department/school will be interviewed to develop

a detailed understanding of the type of information needed by the faculty and students in each subject area.

A number of database vendor products will be reviewed against requirements of the faculty and students (determined from interviews). Products will be selected, based on a number of considerations including:

- **Ease of learning and use**
- **One-time costs (e.g., special hardware and software, initial subscription fees)**
- **Ongoing costs (e.g., communications, regular updates, access fees, etc.)**
- **Uniqueness of data (e.g., which databases meet user data requirements in ways that other databases do not?)**
- **Compatibility with Library Architecture (e.g. what query protocols does the database utilize? Is it Z39.50 compatible? Can the database setup utilize existing equipment and software? How well does the database integrate with the rest of the technical architecture of the Library?)**

The review will consider retaining existing database products versus replacing them with new databases.

Upon the conclusion of the Analysis/Design Phase, a number of databases will be selected for use at the Library. These databases will include CD ROM databases, locally-mounted online databases, and remote online databases.

- **Development/Implementation:**

In this phase, the new database environment will be made operational. All necessary equipment, software, databases, documentation, and lines will be ordered, received, installed, and tested. Passwords will be assigned if necessary. Training of database trainers will be provided. Upon completion of this phase, all databases selected in the previous phase will be accessible to Library users.

Deliverables of the project will include:

- **Database Analysis/Design Document.** This report will describe departmental and subject area database requirements. It will describe which databases will meet requirements, and will provide justification for their acquisition. Costs and benefits will be evaluated.
- **Trained Library staff**
- **An installed and tested database and database access environment**

Benefits

The benefits of this project are:

- Databases typically contain information equivalent to a large number of books. As such, selection of databases deserves the corresponding amount of effort and presents a corresponding amount of value.
- Redundancy of databases will be minimized.
- Databases provided by the Library will be better suit patron and University needs fully.
- Databases selected will better match the overall goals of the Library and University long range plan and systems architecture.
- The project will endeavor to obtain discounts based on multiple site licenses and multiple databases from individual vendors.
- The databases will provide information in computer-readable format which will allow the user to access data faster and in more sophisticated ways.
- Electronic databases will allow information to be accessed from outside of the Library.
- Users will be able to access more timely information. This is especially important in technical areas where access to the most timely information is critical.

Schedule

Phase	Duration
Analysis/Design	3 months
Development/Implementation	4 months
Total	7 months

Duration of the project will depend on the delivery time for database components. Longer delivery timeframes could extend the project completion date.

Staff Requirements

The project will require a Project Manager, a full-time Library Analyst for database analysis, and a part-time Programmer to load databases and configure database systems.

Cost Assumptions

Separate cost estimates have been generated for CD ROM database, databases locally-mounted at ICS, and remote commercial database access. As a rule of thumb, there should be at least one database per subject area.

To estimate the cost of CD ROM databases in 1992, all subject areas were reviewed. To generate a cost estimate, representative databases were selected based on the anticipated needs of each subject areas. **The following databases are not necessarily the databases to be selected for the new University Library. This project will determine the actual databases to be acquired.** Actual costs will depend on subject area requirements and the needs of the majority of Library patrons. As shown below, the annual ongoing CD ROM database cost will be \$60,000. That estimate is broken down as follows:

<u>Bibliographic Citation Sources</u>	<u>Price</u>
ABI/INFORM on disc	\$ 3,750
Applied Science and Technology Index	1,495
Art Index - Wilson	1,495
Books in Print Plus	1,740
Dissertation Abstracts On Disc	1,695
Earth Science Database	350
ERIC	518

Integration Implementation Plan Report

General Science Index	1,295
GPO on SilverPlatter	950
Humanities Index	1,290
InfoTrac on disc	14,840
Library Literature	1,095
Life Sciences Collection	2,250
MathSci on disc	1,685
MLA Bibliography	1,495
PAIS on CD ROM	1,795
PsychLit	1,345
Reader's Guide Abstracts	1,995
Social Science Index	1,295
Sociofile	1,750
Total	42,633

<u>Newspaper Indexes</u>	<u>Cost</u>
National Newspaper Index	\$ 4,000 or
Newsbank Electronic Index	4,580

Full-Text Sources

Computer Library	695
Oxford English Dictionary	950
Microsoft Bookshelf	295
Bible Library	495
Total	2,435

Other

Standard and Poor's Corporations	4,250
Moody's 5000 Plus	2,500+
Patterson's College Database	595
Kirk-Othmer Encyclopedia of Chemical Technology	895
Population Census (1980)	1,200
Microsoft Stat Pack	149
Total	9,589
Grand Total	\$ 59,237

The above \$59,237 figure corresponds to the sum of \$33,000 (existing) plus \$27,000 (new as listed in the spreadsheet). One-time costs for retrospective databases are estimated at \$20,000.

The locally-mounted database budget is based on a survey of current costs and represents expected costs of two large (e.g., Science Citation Index) and one small database subscriptions. Also included in the spreadsheet are ICS processing and support costs for the databases.

Remote database costs are virtually impossible to estimate accurately. The proposed budget is based on a quadrupling of the present budget. The \$45,000 figure in the spreadsheet is in addition to the existing budget amount of \$15,000. Since these costs can be highly variable, appropriate cost control measures must be utilized.

IUPUI University Library - Information Systems Plan

Database Acquisition Project

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware	0	0	0	0
Hardware Subtotal			0	0
Software				
CD ROM Databases	0	0	0	27000
Locally-Mounted Databases	0	0	0	100000
Retrospectives	1	20000	20000	0
Maintenance	0	0	0	0
Software Subtotal			20000	127000
Communications & Processing				
Remote database access	0	0	0	45000
ICS Processing	1	10000	10000	20000
Subtotal			10000	65000
Human Resources (person-months)				
<i>Analysis/Design Phase:</i>				
Project Manager	1	5040	5040	0
Library Analyst	3	5040	15120	0
<i>Development/Implement Phase:</i>				
Project Manager	1	5040	5040	0
Library Analyst	2	5040	10080	0
Programmer	4	5040	20160	0
<i>Ongoing Support:</i>				
Programmer	0	0	0	5040
Human Resources Subtotal			55440	5040
TOTALS			\$85,440	\$197,040

2.1.4 Gateway Project

Description

This project will include:

- A technical architecture for the Gateway/Workstation/Advanced ILIRN components. This architecture will be a more detailed version of that described in the Conceptual Solution and Integration Design Report. These three components are interdependent and hence, an integrated view of the overall technical architecture is important.
- A detailed requirements analysis for the Phase I and II Gateways. By including Phase II at this point, it should be easier to evolve the Phase I Gateway into the Phase II Gateway in the future.
- Technical design of the Phase I Gateway including the search engines and menu services. This technology is evolving rapidly. The project should carry out an evaluation of products available in the market at that time in order to finalize "make or buy" decisions. The Phase I Gateway is described in the Conceptual Solution and Integration Design Report. This phase will also specify interface requirements for any remote workstations which need to connect to the Gateway.
- Acquisition of commercially-available Gateway components and development of other components. User and technical documentation would be developed.
- Implementation and testing of the Gateway
- Training of the technical support staff

The project should develop a prototype in the analysis and design phases to see how the various components of the Gateway will interact. This prototype should be coordinated with the workstation and Advanced ILIRN prototypes. The Gateway will need to address three different workstation station origin points: inside the new Library, elsewhere on campus, and off-campus.

To minimize effort, the Gateway host functions would normally be centralized onto only one discrete platform (e.g., DEC or IBM). Because of the Indianapolis Computing Services commitment to support a multi-vendor environment, an alternative would be to develop the primary Gateway on one platform and to build bridges from the other

Integration Implementation Plan Report

platforms. Developing the Gateway on both IBM and DEC could cost considerably more. As much as is feasible of the Gateway should be implemented on the user workstation.

The project will result in an operational version of the Phase I Gateway as conceptualized in the Conceptual Solution and Integration Design Report.

Benefits

The Gateway is another fundamental component of the Library's information systems structure. The benefits which it will provide are:

- User education, knowledge and effort required to use different applications will be reduced.
- The user-view of the Library information systems will be simplified.
- Users will save time in using systems because the Gateway will handle some of the processing required to bridge systems.

Schedule

Phase	Duration
Architecture	2 months
Analysis	2 months
Design	2 months
Development	5 months
Implementation	1 month
Total	12 months

This schedule is very preliminary for the latter phases, and may vary considerably based on conclusions of the Architecture phase.

Staff Requirements

The project will require a full-time project manager, a lead analyst/programmer to handle the search engine issues, a senior analyst/programmer experienced in telecommunications, a senior analyst/programmer to handle operating systems aspects, a Learning Technologies Design Engineer, a Learning Technologies user interface consultant, and a programmer to look after workstation software. These staff should

have an extensive knowledge of the current operating environment. The overall staff loading during the project is estimated to be about 75% since some staff will be part-time for part of the project.

Cost Assumptions

BRS commercial license costs are used with second site (20%) and educational (5%) discounts. Also included is the Yale terminal emulator which provides support for the ALA character set. The license costs could be decreased if usage was to be restricted to IUPUI students, faculty, and staff. However, such a limitation would contravene IUPUI's intent to provide wide community access to the Library information systems.

The Library will not be required to pay any toll and processing charges incurred by the Gateway.

IUPUI University Library - Information Systems Plan Gateway Project

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Dial-up Port Device(16 ports)	2	13000	26000	0
Other hardware	1	100000	100000	0
Replacement Costs (20%)	0	0	0	25200
Hardware Maintenance(15%)			0	18900
Hardware Subtotal			126000	44100
Software				
BRS/SEARCH	1	130000	130000	0
BRS/Search Maintenance	0	0	0	17280
Other software	1	100000	100000	0
Software Maintenance(15%)	0	0	0	15000
Software Subtotal			230000	32280
Communications & Processing				
Communications Subtotal			0	0
Human Resources (person-months)				
<i>Architecture Definition:</i>				
Project Manager	2	5040	10080	0
Lead Analyst/Programmer	2	5040	10080	0
LT Design Engineer	2	5040	10080	0
LT Interface Consultant	2	5040	10080	0
Sr. Analyst/Programmer	4	5040	20160	0
<i>Analysis Phase:</i>				
Project Manager	2	5040	10080	0
Lead Analyst/Programmer	2	5040	10080	0
Sr. Analyst/Programmer	4	5040	20160	0
<i>Design Phase:</i>				
Project Manager	2	5040	10080	0
Lead Analyst/Programmer	2	5040	10080	0
Sr. Analyst/Programmer	4	5040	20160	0
Programmer	2	5040	10080	0
<i>Development Phase:</i>				
Project Manager	5	5040	25200	0
Lead Analyst/Programmer	5	5040	25200	0
Sr. Analyst/Programmer	10	5040	50400	0
Programmer	5	5040	25200	0
<i>Implementation Phase:</i>				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	1	5040	5040	0
Sr. Analyst/Programmer	1	5040	5040	0
Programmer	1	5040	5040	0
<i>Ongoing Support:</i>				
Sr. Analyst/Programmer	0	0	0	10080
Human Resources Subtotal			297360	10080
TOTALS			\$653,360	\$86,460

2.1.5 Advanced ILIRN Project

Description

Advanced ILIRN (A/ILIRN) is an advanced menuing system, as well as a suite of library related applications. It will be the next generation of the existing ILIRN system. The new University Library will require enhancements to the menuing system and a number of new applications to support its expanded operation. ILIRN is the logical vehicle for delivering these new applications to Library staff and patrons since it already supports a number of Library applications throughout the University campus.

Enhancements will include access to NOTIS/IO, as well as additional Library applications described below. Other necessary enhancements will be determined during the analysis phase of the project where Library staff and patron detailed requirements for ILIRN enhancements will be determined.

Some of Advanced ILIRN will run on workstations, some on the host computer, and some on the Gateway. Because of this, the development team for A/ILIRN will work closely with the Gateway development team to ensure cohesiveness between the two systems.

This project will consist of the following phases:

- **Analysis Phase**

Detailed requirements of the Advanced ILIRN system will be established based on the architecture determined in the Gateway Project. New subsystems will be defined at this time. Possible new subsystems include:

- **Reservation System**

This system will be used to accept requests for and schedule University Library equipment, conference rooms, classrooms, auditorium, video playback facilities, and video media.

- **Quick Reference System**

This system can be used to handle quick reference requests, such as the addresses of Indiana congresspersons.

- **Electronic Library Tour and Instruction (tutorial)**

This system will provide an electronic tutorial about the Library.

- **ILIRN Enhancements**

Portions of the existing ILIRN system will be enhanced and/or rewritten.

Analysis will include definition of necessary management reports and screens. It will also include definition of interfaces to other systems, security requirements, performance characteristics, data flows, field names, and a data dictionary.

- **Design Phase**

The Analysis Phase will result in a detailed document describing 'what' the users of Advanced ILIRN want the system to do. The Design Phase will determine 'how' application software can provide what the users require. The result of this phase will be a detailed design document which will include any specifications for converting from the existing ILIRN to Advanced ILIRN.

- **Development Phase**

The Development Phase will use the Advanced ILIRN design document as a guideline for setting up the development environment and coding software modules. Once modules are coded, they will be tested to ensure that they meet the specifications detailed in the Analysis and Design phases.

- **Implementation Phase**

During this phase, the software modules that were created in the Development Phase will be implemented into the production environment. Users will be trained and an acceptance test will be completed to ensure that the entire system meets the requirements.

The deliverables of this project will include:

- **Advanced ILIRN Requirements Definition/System Specification document which will include:**
 - **Functional Specifications (detailed definition of "what" the users want)**
 - **System Performance and Security goals**
 - **External (human) interfaces - e.g., screen and report layouts**
 - **Acceptance Test plan**
- **Design Document**
 - **Design overview**
 - **Detailed design**
 - **Conversion specifications**
- **Installed, tested, and fully-functional system**
- **System documentation**

Benefits

The benefits of this project include the following:

- **This project will provide new services to Library staff and patrons. These services will be available from any workstation in the Library and from faculty and student workstations around the community.**
- **Some of the new applications will automate functions which are currently done manually, thus giving Library staff more time to perform other functions.**
- **The project will integrate ILIRN with the Gateway.**
- **The project will ensure that Library and patron needs are analyzed and fully met by the enhanced system.**

Schedule

Phase	Duration
Analysis	5 months
Design	4 months
Development	5 months
Implementation	4 months
Total	18 months

Particularly for the latter phases, this schedule is very preliminary. The amount of effort could vary greatly depending on the extent of the requirements.

Staff Requirements

This project requires a Project Manager and at least 2 Senior Analyst/Programmers. Project completion time will depend on the number of programmers working concurrently on the various system components.

Cost Assumptions

Resource projections for the Design, Development, and Implementation Phases are rough estimates. Manpower to develop the system cannot be accurately estimated until completion of the Analysis Phase which will define the extent of enhancements needed for Advanced ILIRN.

Estimated ICS processing costs are based upon the assumption that programmers will be logged onto the system 75% of the time. Programmer hours were multiplied by 75% and the resulting number was multiplied by standard connect time charges. This amount was then quadrupled to include DASD and CPU costs.

**IUPUI University Library - Information Systems Plan
Advanced ILIRN**

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Hardware Subtotal	0	0	0	0
Software				
Software Subtotal	0	0	0	0
Communications & Processing				
ICS Processing	18	403	7258	806
Subtotal			7258	806
Human Resources (person-months)				
Analysis Phase:				
Project Manager	1	5040	5040	0
Lead Analyst/Pgmr.	3	5040	15120	0
Design Phase:				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer.	3	5040	15120	0
Sr. Analyst/Programmer.	3	5040	15120	0
Development Phase:				
Project Manager	2	5040	10080	0
Lead Analyst/Programmer	4	5040	20160	0
Sr. Analyst/Pgmr.	4	5040	20160	0
Implementation Phase:				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	3	5040	15120	0
Sr. Analyst/Programmer	3	5040	15120	0
Ongoing Support:				
Lead Analyst/Pgmr.	0	0	0	10080
Human Resources Subtotal			141120	10080
TOTALS			\$148,378	\$10,886

2.1.6 Management Information Systems Project

Description

While NOTIS/IO provides many useful standard reports, University Library staff will require additional reports as well as access to online data to create their own ad hoc reports. The need for information, both online and hard-copy, needs to be carefully defined to ensure that important operational information is provided to management and that unnecessary information is not provided. This project is expected to be a joint effort with the IU Libraries/UCS team which supports the NOTIS/IO system. It is expected that most, and perhaps all, reports to be generated from NOTIS/IO will be developed in Bloomington.

The project will provide data to management in the following forms:

- Standard reports
- Ad hoc reports
- Downloaded information to be manipulated by PC-based tools

It will consist of the following phases:

- Analysis Phase

In this phase, the various Library staff who require management reports will be consulted to determine their reporting requirements. These managers will be shown existing reports to determine which reports are adequate and what additional information is needed on existing reports. If existing reports are not adequate, new reports will be designed. Layout and timing of reports will be determined (e.g., how often is a report required - daily, weekly, monthly?).

The need for raw management data and tools to manipulate the information will also be determined. For example, perhaps a manager needs to develop an ad hoc report on many bibliographic records are added each month to NOTIS/IO. The data could be downloaded into an electronic spreadsheet on the managers workstation for manipulation using a spreadsheet package.

Lastly, the need for management information which is not available in an existing library system will be determined. Perhaps, for example, a manager

needs to track the number of requests for individual serials documents (this is currently being done manually). Requirements for an automated systems to manage and track such information will be defined.

After collecting the management information requirements, the information gathered will be compiled and analyzed. Some managers may have different names for the same data item. To ensure a common understanding of report headings, a data dictionary will be created to define report headings and data item names.

- **Design Phase**

Given the management information requirements, the mechanisms to generate, collect, process, report, display, store, and manipulate the information will be designed.

- **Development Phase**

In this phase, programs to create and generate the reports or download files at required intervals of time will be created.

Developed reports will be walked through with management to ensure that final reports meet with the approval of managers who requested them. If the tools were not previously installed, they will be implemented.

- **Implementation Phase**

The developed management information systems will be initiated. Management will be trained on the use of the systems.

The project deliverables will be:

- Mock-ups of all reports
- Data dictionary/data item and heading definitions
- Requirements document
- Regular daily, weekly, monthly, and/or yearly reports
- Ad-hoc reporting capability
- Training

Benefits

This project will provide considerable savings in person hours applied toward certain functions. Other benefits are:

- Management information serves managers in a similar way that an airplane instrument control panel serves the pilot. Both pilots and managers need information on which to base their decisions. This management information is expected to enhance the efficiency, economy, and effectiveness of Library operations. This will be especially important in view of the increased Library expenditures and the campus role intended for the new Library.
- Management information will be more accurate.
- This project will ensure efficient, accurate and timely reports that meet management needs.
- Reports that are not needed will not be generated and management will only receive the reports that they require. This will reduce paper, delivery, and processing costs.
- The Library will be able to better meet patron and University needs because of increased awareness of operational information and patron needs. Also, the Library will be able to better monitor what services are in demand and to track peak periods so that these periods can be better serviced.

Schedule

Phase	Duration
Analysis	3 months
Design	2 months
Development	4 months
Implementation	1 month
Total	10 months

The duration of the Development phase could vary considerably depending on the actual management information system requirements determined in the analysis phase.

Staff Requirements

This project will require a Project Manager, a Lead Analyst/Programmer, and at least one Senior Analyst/Programmer.

Cost Assumptions

Resource estimates are very rough. For example, until analysis is completed, the time needed to develop reports cannot be estimated.

No additional hardware or software is included for this project. It is assumed that most management information processing will be done on workstations.

IUPUI University Library – Information Systems Plan

Management Information Systems

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Hardware Subtotal	0	0	0	0
Software				
Software Subtotal	0	0	0	0
Communications & Processing				
ICS Processing	10	403	4030	0
Subtotal			4030	0
Human Resources (person-months)				
Analysis Phase:				
Project Manager	0.5	5040	2520	0
Lead Analyst/Programmer	1	5040	5040	0
Design Phase:				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	1	5040	5040	0
Development Phase:				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	3	5040	15120	0
Implementation Phase:				
Project Manager	5	5040	25200	0
Lead Analyst/Programmer	1	5040	5040	0
Ongoing Support:				
Programmer	0	0	0	5040
Human Resources Subtotal			68040	5040
TOTALS			\$72,070	\$5,040

2.1.7 Public Information Display System (PUBS) Project

Description

Located in lobby areas of the Library, the Public Information Display System will consist of freestanding kiosk/consoles with displays and input keyboards which patrons will use to locate services within the new Library. To provide these systems, the following steps will be necessary:

- Define the detailed requirements for the system.
- Design the system.
- Acquire, install, and test the hardware and packaged application software.
- Using the base application software acquired, add the programming and data necessary. For example, the system should have the capability to show on the display how to locate the Library service selected by the patron.

University Computing Services already has some similar devices which should be considered as an alternative.

The result of this project will be a number (probably four) of operational Public Information Display Systems.

Benefits

Because IUPUI students, faculty, and staff will be unfamiliar with the new Library when it opens, there will be a requirement to provide them with information as to where to locate items. People from the community will also need assistance in orienting themselves in the Library.

The alternative would be to have additional staff available at information desks at each entrance and on each floor of the Library. The information desk would have to be staffed whenever the Library is open, requiring several shifts per day at each desk.

The PUBS will substantially reduce the need to rely on staff to answer questions. It will also be the first visible symbol of information technology patrons will encounter on entering the building.

Schedule

Analysis/Design should include acquisition of the components. Development/Implementation should include installation and loading of the Library graphics and data.

Phase	Duration
Analysis/Design	3 months
Development/Implementation	3 months
Total	6 months

Staff Requirements

The project team should be as small as possible, consisting of a part-time project manager supervising a programmer.

Cost Assumptions

There will be four PUBS "kiosks". There will be one at the entrance on the main level, one at the second level walkway entry, and one on each of the top two floors in the Library.

It is assumed that the systems can be purchased as a package, including the kiosk shell, the processor, the display, the keyboard, a built-in printer, and the graphic software. The Library information would have to be loaded, displays (e.g., a floor layout with a marker flashing at the desired location) created, and periodically updated.

**IUPUI University Library - Information Systems Plan
Public Information Display System Project**

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
PUBS Kiosk	4	8000	32000	0
Replacement costs (20%)	0	0	0	6400
Hardware Maintenance (15%)	0	0	0	4800
Hardware Subtotal			32000	11200
Software				
PUBS Software Package	4	2000	8000	0
Software Maintenance (20%)	0	0	0	1600
Software Subtotal			8000	1600
Communications & Processing				
Communications	0	0	0	0
Communications Subtotal			0	0
Human Resources (person-months)				
Analysis/Design Phase:				
Project Manager	1	5040	5040	0
Programmer	3	5040	15120	0
Development/Implement Phase:				
Project Manager	0.5	5040	2520	0
Programmer	2	5040	10080	0
Technician	1	5040	5040	0
Ongoing Support:				
Programmer	0	0	0	5040
Human Resources Subtotal			37800	5040
TOTALS			\$77,800	\$17,840

2.1.8 Configuration Management System Project

Description

The new University Library will have an extensive inventory of personal computers, audio-visual equipment, printers, modems, and other hardware. To track information such as configuration, serial numbers, warranty and repair information, and purchase date, a small, workstation-based system needs to be implemented. The need for such a system is campus-wide. It may be preferable for IUPUI to acquire/develop the system for campus-wide use, in which case the scope of this project would be limited to implementing the system for the Library. The project will have the following phases:

- **Analysis Phase**

In this phase, the following activities will occur:

- The requirements of the new system will be defined.
- Information to be stored in the system as well as interfaces to other systems will be determined.
- Reports and screen layouts will be defined.
- Whether the system should be a stand-alone or a networked application will be determined.

- **Design Phase**

In this phase, a system will be designed which will meet the requirements defined. It is hoped that the Library will be able to acquire an existing package system which will meet the needs. The University already has an inventory system that tracks items of over \$5000 in value. However, that system is intended for audit purposes rather than configuration management. Another alternative is the system that ICS currently uses. It may require some further development to meet Library needs. If the Library cannot acquire a system to meet its needs, one will be designed. It is expected that the system will reside on a workstation/file server, it will be accessible from any workstation on the network, and it will utilize a personal computer database software package such as Oracle or dBase IV.

Integration Implementation Plan Report

- **Development Phase**

If acquired software needs to be customized, or if a new system must be developed, that programming will be done and tested in this phase.

- **Implementation Phase**

The system will be acceptance tested and the users will be trained. Configuration data will be loaded, and the system will be made operational.

The project deliverables will be:

- Requirements Document
- Design Document
- Developed, tested and implemented system
- Documentation

Benefits

Benefits of this project include:

- The Library will be able to track ongoing costs of equipment.
- It will be able to track when equipment needs to be replaced or regularly maintained.
- It will be able to track if a piece of equipment routinely breaks down and should be returned to the manufacturer or replaced.
- It will ensure better servicing and control of Library equipment in the long run.
- Maintenance costs will be decreased by taking better advantage of equipment warranties.

Schedule

Phase	Duration
Analysis	2 months
Design	2 months
Development	2 months
Implementation	1 months
Total	7 months

The duration of the Design, Development, and Implementation phases could vary depending on whether it is necessary to custom-develop the system.

Staff Requirements

This project will require a part-time Project Manager and a Senior Analyst/Programmer.

Cost Assumptions

The cost of this project will increase significantly if the Library decides to design and develop a custom system.

It is assumed that the system will be designed, selected, and implemented for Library use only. Including campus-wide considerations would increase the amount of effort required.

IUPUI University Library – Information Systems Plan Configuration Management System Project

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Hardware Subtotal	0	0	0	0
Software				
Software Package	1	2000	2000	0
Software Maintenance (15%)	0	0	0	300
Software Subtotal			2000	300
Communications & Processing				
Communications Subtotal	0	0	0	0
Human Resources (person-months)				
Analysis Phase:				
Project Manager	0.5	5040	2520	0
Lead Analyst/Programmer	1.5	5040	7560	0
Design Phase:				
Project Manager	0.5	5040	2520	0
Lead Analyst/Programmer	1.5	5040	7560	0
Development Phase:				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	1.5	5040	7560	0
Implementation Phase:				
Project Manager	0.5	5040	2520	0
Lead Analyst/Programmer	1	5040	5040	0
Ongoing Support				
Programmer	0	0	0	2000
Human Resources Subtotal			40320	2000
TOTALS			\$42,320	\$2,300

2.1.9 Chargeback System Feasibility Study Project

Description

The Library will have many new costs associated with providing patrons with a state-of-the-art operation. Policies which define how to recoup the costs of expensive resources will need to be determined. Before fair and reasonable policies can be created, the various cost items (such as printer paper, printer cartridges, CPU time, and database access costs) need to be identified and alternative mechanisms to charging back those resource costs to users evaluated.

This project will likely involve many other entities including Indianapolis Computing Services, University Computing Services, University Accounting, and the Indiana University-Bloomington Library. The onecard project will have important implications for processing Library charges. An important scope issue is which of the following architectures the University Library chargeback system would be based on:

- An IUPUI University Library system
- An Indiana University Library System system
- One of the above and interfaced to a University-wide chargeback system

Because of the above scope issue, it remains to be seen what role the IUPUI University Library will have in implementing chargeback mechanisms. However, because of its position on the leading edge of this issue, it will be in a good position to exercise some leadership in the situation. Policy will depend on what can be reasonably and cost-effectively implemented.

The project will consist of the following phases:

- Policy Development Phase

In this phase, IUPUI Library staff and University policy makers will be interviewed to gather ideas and develop policy regarding:

- Feasibility of a chargeback system
- What items are to be charged for

- Relationship of the Library Chargeback system to other systems on campus, such as the proposed onecard system

This interim draft document will define the Library's policy towards charging for resources based on the conclusions developed during this phase.

- **Architecture Phase**

This phase will:

- Explore ways of automating the policy developed during the previous phase.
- Examine the onecard system for possible use in charging
- Consider ways of charging for resources, ranging from collecting monies as resources are used to debiting the cost of resources from a student debit card

Alternative solutions will be evaluated and the costs and benefits associated with each solution documented. The most cost-effective solution will be recommended.

- **Implementation Plan Phase**

This phase will develop the plan to implement the chargeback system recommended in the previous phase.

The following deliverables will be generated by the project:

- Requirements analysis
- Policy Report
- Architecture Report
- Implementation Plan

These reports will be reviewed by University Library management and other involved University decision-makers. Depending on the ensuing decision, it is likely that another project will have to be carried out to do the detailed design, development, and implementation of the selected alternative.

Benefits

- A policy is needed to determine how to make fair, and reasonable financial decisions regarding how to recoup the costs of expensive resources.
- This project will ensure better acceptance of any policy which is implemented.
- The chargeback system has university-wide implications which must be considered and the policy must be made within the framework of University Policy. The solution should consider systems which will be in place such as the onecard system.
- The new Library will incur substantial new costs in providing new services. Those costs could be offset partially by revenue accumulated through a chargeback system.

Schedule

Phase	Duration
Policy Report	4 months
Architecture	2 months
Implementation Plan	2 months
Total	8 months

The project is estimated at eight months for two full-time resources. Actual project completion time will depend on the amount of time required for document review and incorporation of changes. If the review process takes excessive time, it could delay the commencement of the next phase(s).

Staff Requirements

This project requires a Project Manager/Senior Library resource. That person must have a good understanding of the IUPUI University Library and some technical knowledge. The project also requires a lead analyst/programmer to advise on technical issues and opportunities.

Cost Assumptions

This estimate does not include the costs of designing, developing, and implementing a chargeback system. The multiplicity of options precludes the development of that estimate at this time.

IUPUI University Library - Information Systems Plan Chargeback System Feasibility Study

Item	One-Time Costs			Ongoing Costs
	Quantity	Unit Cost	Total	Annual Costs
Hardware				
Hardware Subtotal			0	0
Purchased Software				
Software Subtotal			0	0
Communications Charges				
Communications Subtotal			0	0
Human Resources (person-months)				
<i>Policy Report:</i>				
Project Manager	2	5040	10080	0
Lead Analyst/Programmer	1	5040	5040	0
<i>Architecture:</i>				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	1	5040	5040	0
<i>Recommendations</i>				
Project Manager	1	5040	5040	0
Lead Analyst/Programmer	1	5040	5040	0
Human Resources Subtotal			35280	0
TOTALS			\$35,280	\$0

2.1.10 Multi-Media Systems Project

Description

The new Library will be an integrated multi-media center. The multi-media facilities include the Scholar's workstation video interface, the auditorium, two classrooms, media library, media conversion room, production studios, the consulting center, the building fiber video network, switching and playback facilities including playback units and video playback stations, audio-visual equipment pool, engineering offices, and video connections to the Campus Network. These facilities will be used to provide enhanced multi-media electronic learning environments for students and faculty.

The sophisticated equipment for these facilities must be specified, designed, acquired, installed, and tested. Some of the systems will require research and development activity. Staff will require training to support and operate the systems.

Although the Office of Learning Technologies has primary responsibility for the effort, a Library coordinator will represent University Libraries on the project team.

The Scholar's Workstation effort must be carried out in conjunction with the WORKS project.

Benefits

Video, audio, computer data, and paper media are all valuable forms of informational media. Through integration of those informational media, the Library will be a richer and more effective information resource to students and faculty.

By providing resources to coordinate efforts with the Office of Learning Technology (OLT), it is expected that multi-media will be better integrated into the Library systems environment. Through enhanced communication between the Library and OLT, management of the costs and effort associated with the multi-media installations should be enhanced. Since some of the technology to be used is of a leading edge nature, the additional attention and control to be applied through this project is considered to be especially beneficial.

Schedule

This project should begin immediately, and will have a duration of several years, finishing only when the Library has opened and final testing and implementation of the multi-media systems has been successfully completed.

Staff Requirements

The Office of Learning Technologies will provide the project manager.

The Library coordinator role is a part-time liaison responsibility for a person with library, management, and some technical skills, requiring about four man-months in total.

The effort required to implement the equipment for the media conversion, media library, equipment pool, and engineering offices will be handled by bringing the ongoing support staff onboard in early 1992.

The number of operations staff is based on the assumption that the facilities need to be open when the Library is open, thereby requiring shift operation, but that the conversion area staff can cover the switch room in off hours.

Cost Assumptions

Development staff are costed at \$30 per hour except for the Project Manager who will be a senior individual and is expected to cost about \$50 per hour.

Switching and distribution of the video signal will be based on fiber optic technology.

IUPUI University Library – Information Systems Plan

Multi-Media Systems Project

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Video Switch	1	400000	400000	
Video Playback:				
Stations	20	2000	40000	
Film Chain	2	75000	150000	
VCRs	30	3500	105000	
Racks	3	3000	9000	
Operator Station	1	15000	15000	
R & D Prototype	1	20000	20000	
Rem. Control Interface	1	15000	15000	
Remote Control Software	1	10000	10000	
Scholars Workstation:				
Video Interface Adaptr	56	1500	84000	
R & D Prototype	1	40000	40000	
Consulting Misc. Eqmt.:	1	10000	10000	
Auditorium Eqmt.:	1	105000	105000	
Classroom 1 Eqmt.:	1	85000	85000	
Classroom 2 Eqmt.:	1	77000	77000	
Media Conversion:				
VCRs	4	10500	42000	
Slide to Print Machine	1	10000	10000	
Workstation	1	8000	8000	
Media Library:				
Workstation	1	8000	8000	
Special Shelves	1	50000	50000	
Checkout Platform	1	15000	15000	
Equipment Pool:	1	150000	150000	
Engineering Labs Eqmt.:	1	250000	250000	
Engineering Office:	1	100000	100000	
Studio & Editing Areas:				
Edit Equipment	2	20000	40000	
Audio Equipment	2	50000	100000	
Video Equipment	2	100000	200000	
Preview Rooms Equipment:	4	50000	200000	
Replacement Costs (30%)	0	0	0	701400
Hardware Maint. (20%)	0	0	0	467600
Hardware Subtotal			2338000	1169000

**IUPUI University Library - Information Systems Plan
Multi-Media Systems Project (cont.)**

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Software				
Software	0	0	0	0
Software Maintenance	0	0	0	0
Software Subtotal			0	0
Communications				
Communications	0	0	0	0
Communications Subtotal			0	0
Human Resources (person-months)				
Library Coordinator	4	5040	20160	
Project Manager	12	8400	100800	
Video Switch:				
Technician (2)	12	5040	60480	
Hardware R & D Techn.	6	5040	30240	
Software R & D Pmgr.	6	5040	30240	
Video Playback:				
Hardware R & D Techn.	3	5040	15120	
Software R & D Pmgr.	3	5040	15120	
Technicians (2)	6	5040	30240	
Scholars Workstation:				
Hardware R & D Techn.	12	5040	60480	
Software R & D Pmgr.	12	5040	60480	
Interface Specialist	24	5040	120960	
Ongoing Support:				
Cons. Center Techn.(3)	1	40000	40000	128000
Media Librarian	1	20000	20000	40000
Media Lib Asst.(2)	1	27000	27000	54000
Media Conv. Ops.(3)	1	50000	50000	100000
Switch Operator	1	15000	15000	33400
Engineer	1	25000	25000	51000
Assistant Engineer	1	20000	20000	45000
Human Resources Subtotal			741320	451400
TOTALS			\$3,079,320	\$1,620,400

2.1.11 Support Infrastructure Project

Description

The support structure (functions, policies, and organization) required to develop, maintain, and operate the Library information systems needs to be put in place. The project to accomplish this will include the following activities:

- Definition and documentation of job descriptions
- Recruiting and training of the Library Information Systems Unit Head
- The various participating organizations (University Libraries, Indianapolis Computing Services, the Office of Learning Technologies, Telecommunication Services, the NOTIS/IO support organization, SULAC, and others) will need to discuss and agree on assignment of functions and responsibilities.
- Definition and documentation of information systems-related policies
- For public relations and general information purposes, a videotape program should be developed to show the campus and surrounding community the features of the new Library and its electronic information systems.

Benefits

Despite and indeed because of their advanced technologies, the Library's information systems will require sophisticated support for their operation, maintenance, and development. Considering the size of the investment to be made in electronic information systems technology, it is wise to allocate some of those funds to ensuring the ongoing success of the investment.

Schedule

Because much of the new Library operation will depend on this support infrastructure and since the timeframe to develop the infrastructure is limited, it is urgent that this project begin and be completed as soon as possible.

The first task of the Head of the LIS Unit should be to establish the support infrastructure described above. The LIS Unit Head will also have Project Director responsibilities for the other projects in this implementation plan, and therefore will be spending time to initiate and oversee those projects.

The videotape program should be done after the workstation prototype is available for demonstration purposes.

Staff Requirements

The development of the job description and carrying out the recruitment process is expected to require about two person-months over about 6 elapsed months.

Once recruited, the Head of the LIS Unit would be committed full-time to supporting systems development and operations, and to establish the balance of the support infrastructure as described in the Conceptual Solution and Integration Design Report.

Cost Assumptions

The costs associated with the Head of the LIS Unit include salary (\$50,000 annually), 35% benefits (e.g., medical insurance), and a \$10,000 annual administrative, travel, and training budget. Therefore, the annual costs are \$77,500.

The LIS Unit will have an ongoing research budget to be used to maintain the Library's awareness of, and a Library participation in, the state-of-the-art in Library information systems technology.

IUPUI University Library - Information Systems Plan

Support Infrastructure Project

Item	One-Time Costs			Annual Ongoing Costs
	Quantity	Unit Cost	Total	
Hardware				
Research Funds	0	0	0	25000
Hardware Subtotal			0	25000
Software				
Video program	1	35000	35000	
Software Subtotal			35000	0
Communications & Processing				
Communications Subtotal			0	0
Human Resources (person-months)				
Library Recruiter	2	7000	14000	0
LIS Unit Head	4	6500	26000	77500
Human Resources Subtotal			40000	77500
TOTALS			\$75,000	\$102,500

2.1.12 Training Project

Description

Although the new Library information systems will be designed to require as little training as possible to use them effectively, considerable effort will be required to train users and support staff. This project will:

- Prepare a user documentation package
- Develop and deliver/arrange initial training courses
- Establish an organization to provide ongoing training support for the Library information systems

Trainees would include: students, faculty, staff, interested people from the community, other trainers, and technical support staff. Individual classes, user documentation packages, online help, short courses, and video programs would be used. Training would be needed for NOTIS/IO, workstation usage, workstation software, CD ROM database usage, remote database usage, and system software (for technical support staff). There will be a one-time start-up training effort followed by ongoing training activity.

Each project should generate any required user documentation. The training project would set standards and package the resulting documentation.

Benefits

The substantial investment to be made in the Library information systems would be poorly-spent if the ongoing support of the systems was inadequate or if users were unable to fully-benefit from them.

Trained Library information systems support staff will be more effective in their jobs, enriching Library services and reducing the number of support staff which would otherwise be necessary.

Trained, proficient Library systems users will benefit from reduced time required to locate, access, and process information. They will be able to "mine" more valuable information from the various information repositories. More importantly, however, they will also be better prepared to compete in the information-intensive world of the twenty-first century.

Schedule

This project will need to be initiated in time for the training organization to be in place and operational so as to establish the training program for the Library opening.

Staff Requirements

The training group will require a trainer/supervisor, two trainers, and a clerical resource. The trainers should be experienced with library information systems environments. Probably reporting to the Head of the LIS Unit, the trainer/supervisor would be recruited first and would be responsible for recruiting and organizing the rest of the group. They should not attempt to duplicate training services already available on campus.

Cost Assumptions

As indicated in the spreadsheet, there will be significant costs for training materials. The University may wish to consider selling the materials through the bookstore.

IUPUI University Library – Information Systems Plan Training Project

Item	One-Time Costs			Ongoing Annual Costs
	Quantity	Unit Cost	Total	
Hardware				
Hardware Subtotal			0	0
Purchased Software				
Software Subtotal			0	0
Communications Charges				
Communications Subtotal			0	0
Training Materials				
Materials Subtotal			50000	25000
Human Resources (person-months)				
Trainers and Clerical Support			160000	150000
Human Resources Subtotal			160000	150000
TOTALS			\$210,000	\$175,000

2.1.13 External Projects

The following projects will be important to the Library information systems, but are beyond the direct purview of the University Library. Other organizations have responsibility for these projects. However, the University Library should support and actively participate in the projects.

Further Development of NOTIS/IO

There are a number of enhancements to NOTIS/IO which would be beneficial to the new Library and the other members of the NOTIS/IO user community. Development and/or coordination of these enhancements would be the responsibility of Indiana University Libraries. The enhancements are of two types: modifications to the NOTIS package itself, and new interfaces between NOTIS/IO and other agencies. The main enhancements desired are:

- Interfaces to serials vendor and book publisher systems to automate ordering, order tracking, and invoicing transactions
- An interface to University accounting to support invoice authorizations and purchase orders
- Fund accounting support
- Increased workstation functionality
- Patron file linkage to student, faculty, and staff databases
- Z39.50 compatibility
- Enhanced ILL support
- Management reporting

The development of accounting interfaces would have three fronts. University Libraries and University Computing Services would construct the NOTIS/IO side of the interface. University accounting would construct their side of the interface. All three organizations would have to commit resources for the project.

The University Library should participate in the definition of requirements for the IUPUI and University Library specific NOTIS/IO interfaces. The development of these interfaces should be monitored and the end-product tested to ensure that the interfaces meet University Library requirements.

Onecard System

The Library should participate in and monitor the development of the onecard system in order to ensure that the system is usable and advantageous to the Library. The particular applications of interest are:

- Use of the onecard as a patron card for circulation and the onecard database for authenticating patron information
- Use of the onecard as an ID card or debit card for the future Chargeback System
- Security access card to staff and secure areas

2.2 Project Sequence

Project duration, sequence, and FTE manpower estimates are shown graphically in Figure 2-1. The schedule is based on the following:

- The Building Wiring Project will have a gap between completion of the detailed design and start-up of installation.
- The Gateway Project includes an initial architecture definition phase to determine how to best integrate the Gateway, Advanced ILIRN, and the Workstation (WORKS) projects. These projects will then commence individually upon conclusion of this initial phase.
- The Database Project has been scheduled to conclude close to the opening of the new University Library. This will ensure that database subscriptions do not begin until they can be used by Library patrons and that the Library will not pay for the databases when they are not in use. CD ROM databases cannot be implemented until the conclusion of the WORKS CD ROM Subproject project.
- The PUBS project should commence later in the time-frame since the system will not be used until the new University Library opens in 1992.
- The Configuration Management System should be implemented prior to ordering and configuring the Library workstations. This will enable the new University Library to fully track and inventory all equipment and components.
- The Management Information Systems project should commence once NOTIS/IO is implemented. The reports defined in this project can be used prior to the opening of the new University Library.
- The Building Wiring and the WORKS project will continue for some time after the new Library building opens so that any outstanding wiring and workstation problems can be resolved.
- The Support Infrastructure project should begin as soon as possible.

IUPUI University Library Information Systems Plan Project Schedule (Calendar Year)

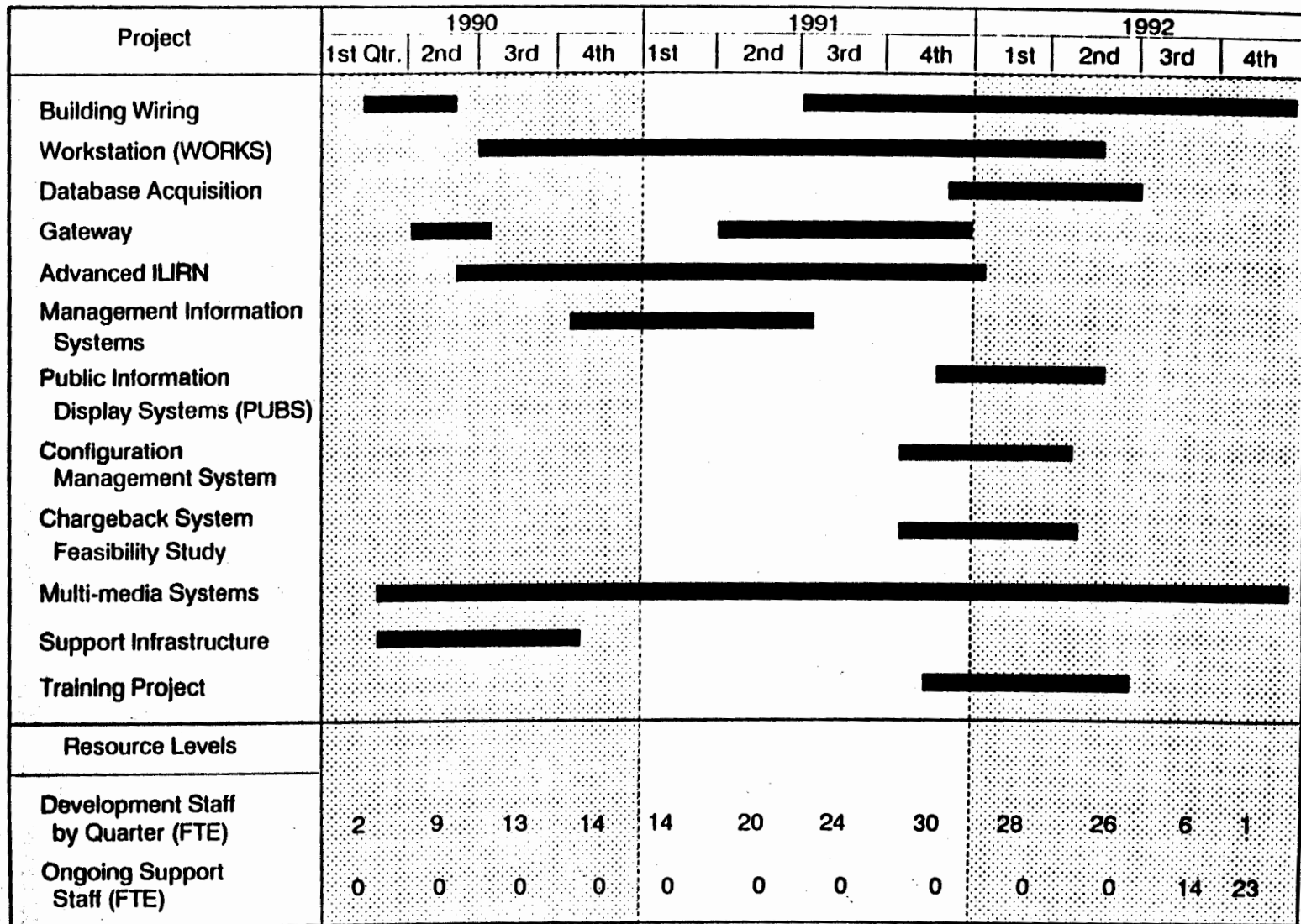


Figure 2-1

2.3 Implementation Considerations

In addition to describing the projects to be carried out and setting a schedule, it is also important for an information systems plan to provide high-level guidance on strategies to maximize the success of the activity resulting from the plan. This is particularly significant for the new Library since there will be many sophisticated, interdependent projects which must be executed concurrently. This section describes some global strategies, funding strategies, and systems development methodologies pertinent to the new Library.

2.3.1 Global Strategies

Much of what the new Library proposes to accomplish will be readily available "off the shelf". Some of the requirements will necessitate custom development. Other requirements will involve leading edge research and development. The relative proportions of these three acquisition approaches will vary depending on the actual rate of technical evolution and on the detailed requirements. Custom development is typically more costly than 'off the shelf' acquisition. Research and development activity is far more costly and time-consuming than custom development. Ideally, all components would be available "off the shelf". Many of the projects will have to make "build or buy" decisions. These decisions should be based on the urgency of the requirement and the cost/benefit of meeting the requirement sooner rather than later.

Project management and technical integrity of the various projects will be major challenges. The Head of the LIS Unit should have the role of Project Director for all projects, exercising control and oversight, but not direct project management. The project manager of the Gateway project should coordinate all related activity for the Workstation Platform, Gateway, and Advanced/ILIRN projects. The Gateway Project should also have a Technical Architect who will have responsibility for the technical integrity of all University Library Phase I information systems projects.

It is desirable that systems developed for the new Library will be usable by other IU system libraries. Also, much of the development will relate to NOTIS/IO. University Libraries in Bloomington has considerable library systems expertise. For these reasons, it will be necessary and helpful to coordinate development with University Libraries. Joint development effort should be considered for some of the development (e.g., Management Information Systems).

Documentation and training will be important activities at three levels: users, trainers, and support staff. Students will receive training on the new Library systems through the TIPS (Today's Information Processing Skills) program provided by ICS. Reference librarians will provide ongoing user training support.

Acquisition is a complex process in itself. Some of the resources may be provided by Indianapolis Computing Services and other already-established University supply channels. Other resources will be acquired through Request for Proposal (RFP). This involves development of explicit, detailed specifications for the resources to be provided. Those specifications will be included in an RFP package(s) to be sent to appropriate vendors. Vendor responses will be evaluated, a vendor selected, the process will be documented, and a contract(s) will be negotiated and finalized. Within the RFP option, the Library has two acquisition alternatives:

- Developing internally, or acquiring the components from various vendors and integrating them into a functioning system. This approach will require significant University staff resources. The University would also be assuming the responsibility that the resulting system would function as specified.
- Contracting with a systems integration firm which would handle all acquisition and take responsibility for integrating all components. Fewer University resources would be required, and the systems integrator would be accountable for achieving the results specified.

Funding of the new Library will be limited, and the expenditure of those funds should be balanced among the various objectives of the Library. For example, rather than all workstations having the same functionality, there should be some workstations which have as advanced functionality as possible so that the Library can maintain an involvement in the leading edge of library systems technology.

The Library should explore and establish relationships with academic and private sector research labs to participate in the development and piloting of advanced library information systems technology. In addition to providing access to new technology, such relationships may also present funding opportunities.

2.3.2 Funding

The costs for the Library information systems are presented in Section 3.2. This section presents alternative strategies for funding the endeavor.

The \$32 million Library building budget excludes information system costs. These costs will have to be funded separately. The following alternatives should be explored:

- **Grants.** For example, the U.S. Department of Education, Office of Library Programs, provides grants to libraries for projects that provide leadership in the application of information technology to the acquisition, organization, storage, retrieval, and dissemination of information resources that encourage networking and resource sharing. Their funds are limited. In 1989, their appropriation was \$3.65 million and is divided up among many projects (46 in 1988).
- **Technology Fee.** If IUPUI was to implement a Technology Fee, some of the resulting revenue could be applied to the one-time and operational costs of the new Library. To be competitive in the employment market and in the academic world, students need access to current technology and should be prepared to contribute to the cost of that technology.
- **Private Contributions.** Private donors and technology companies may wish to contribute funding and/or technology for use in the new Library. Certain components of the Library's information systems (e.g., handicapped systems, Scholars workstations) may be particularly appealing to such donors.
- **Legislative Allocation.** The state government has made a commitment to fund a state-of-the-art electronic library at IUPUI.
- **Chargeback Revenue.** Library operational costs could be offset by chargeback revenue.

2.3.3 Development Methodology

There are significant risks and challenges associated with the realization of this information systems plan. Those risks can be better-managed, and the challenges more successfully achieved, with a sound approach to systems development. That approach has three major components:

- Lifecycle
- Project Control
- Tools and Techniques

2.3.3.1 Lifecycle

The lifecycle is a sequence of manageable, time-based components or phases through which every project evolves, starting with a plan and progressing through analysis, design, development, implementation, and ongoing support. By breaking a project into predefined, deliverable-based phases, projects will be more controllable.

Traditional development methodologies have many weaknesses:

- They require detail too soon. To be useful for design, the requirements document must be detailed. However, the production of detailed requirements without the benefit of a scope and context phase results in detail being produced for unnecessary functionality. A similar problem occurs in design when a detailed design is produced without the context of a general design which provides a framework for shared utilities and common modules.
- They are monolithic. Analysis is conducted explicitly only once. The requirements are documented in paper form and the users are expected to accept them without benefit of viewing a design and implementation in prototype form.
- The length of time from when the user accepts the requirements specification until the delivery of the next user-oriented deliverable. By the time the programming is actually delivered to the user to test, the investment in the system is substantial, and the users cannot easily change the system.

The Library should use an iterative lifecycle as shown in Figure 2-2. At each phase in the lifecycle, there are four generic activities which are performed: planning, analysis, design, and construction. As the project progresses through the lifecycle for a typical project, the level of detail in each of those areas increases. The lifecycle phases are:

Systems Plan

At the heart of the spiral is the information systems plan. It sets general management and technical directions for information systems. The Library will want to periodically (probably in conjunction with the biannual budget cycle) revisit the plan to ensure that it remains accurate with respect to Library needs, resources, and technology directions.

Each project and phase will begin by developing more detailed workplans for themselves.

Architecture

The objective of this phase is to confirm and refine the high-level conceptual solution identified in the Systems Plan into an optimal solution to the problem. This involves taking the requirements from the Systems Plan to the next level of detail in order to address and structure all of the elements which make up an integrated solution.

The requirements fall into two classes: application and technical. The application requirements are defined using functional decomposition charts, data flow diagrams, entity-relationship models and narrative process descriptions. The technical requirements are defined in terms of such parameters as performance, security, capacity, ergonomic considerations, system availability, maintainability, system management, environmental factors, and adherence to industry standards.

Once the requirements have been identified, the Architecture is designed. The Architecture decomposes the system into subsystems, and identifies the logical and physical hardware platform on which the system will operate.

Analysis

The objective of the Analysis phase is to specify the proposed solution in detail. When the phase is completed, the system will have been specified in enough detail to proceed with the application system design. It concentrates on what the system will do as defined from the user perspective.

The bulk of the analysis activity is conducted in the Analysis phase. The 80/20 rule can be used for suggesting how the analysis effort should be split between the Architecture and Analysis phases. In the Architecture phase, 20 percent of the analysis effort is completed to determine 80 percent of the requirements. In the Analysis phase, 80 percent of the effort is completed to take the understanding of the requirements to a fine-grained level of detail.

Based on the Architecture and the incoming specifications, two prototypes can be prepared.

The horizontal prototype communicates the scope of the system's functionality (e.g., through menus) to the users. It defines the nature of the user interface and dialogue, verifies the proposed direction of design, and introduces users to their system. It usually consists of a number of canned scenarios which illustrate how the system will work for the user. It normally does not include a database or code to support application processes.

The technical prototype is used to demonstrate the technical feasibility of linking together a number of different hardware components or to simulate how the system will perform under load.

Design

The Analysis phase specified in detail 'what' the system will do. The Design phase specifies 'how' the system will accomplish the 'what'. The objective is to completely specify the technical design of the system to the level of detail required for construction during the development phase.

Any external products required are selected during this phase.

A vertical prototype can be developed which incorporates working code for some of the core functionality of the system. It provides a working model of the system which permits the team to verify assumptions, refine the understanding of the user requirements, and determine an optimal design.

Development

The objective of this phase is to construct and test all system components. The system is tested by both developers and users. All documentation and training materials are completed. When the Development phase is complete, the system is ready for implementation.

Development includes site preparation and receipt of all purchased hardware and software.

The iterative process of planning, analysis, design, and construction continues throughout the remainder of the lifecycle to define *how* the system will be implemented.

Implementation

The objective of the Implementation phase is to make the new system operational. Users are trained, data files are converted, the system is made available to users, and the systems and procedures are made operational.

Ongoing Support

All systems require some level of ongoing support to handle problems and to make upgrades to the system as new approaches and requirements arise.

ITERATION OF ANALYSIS

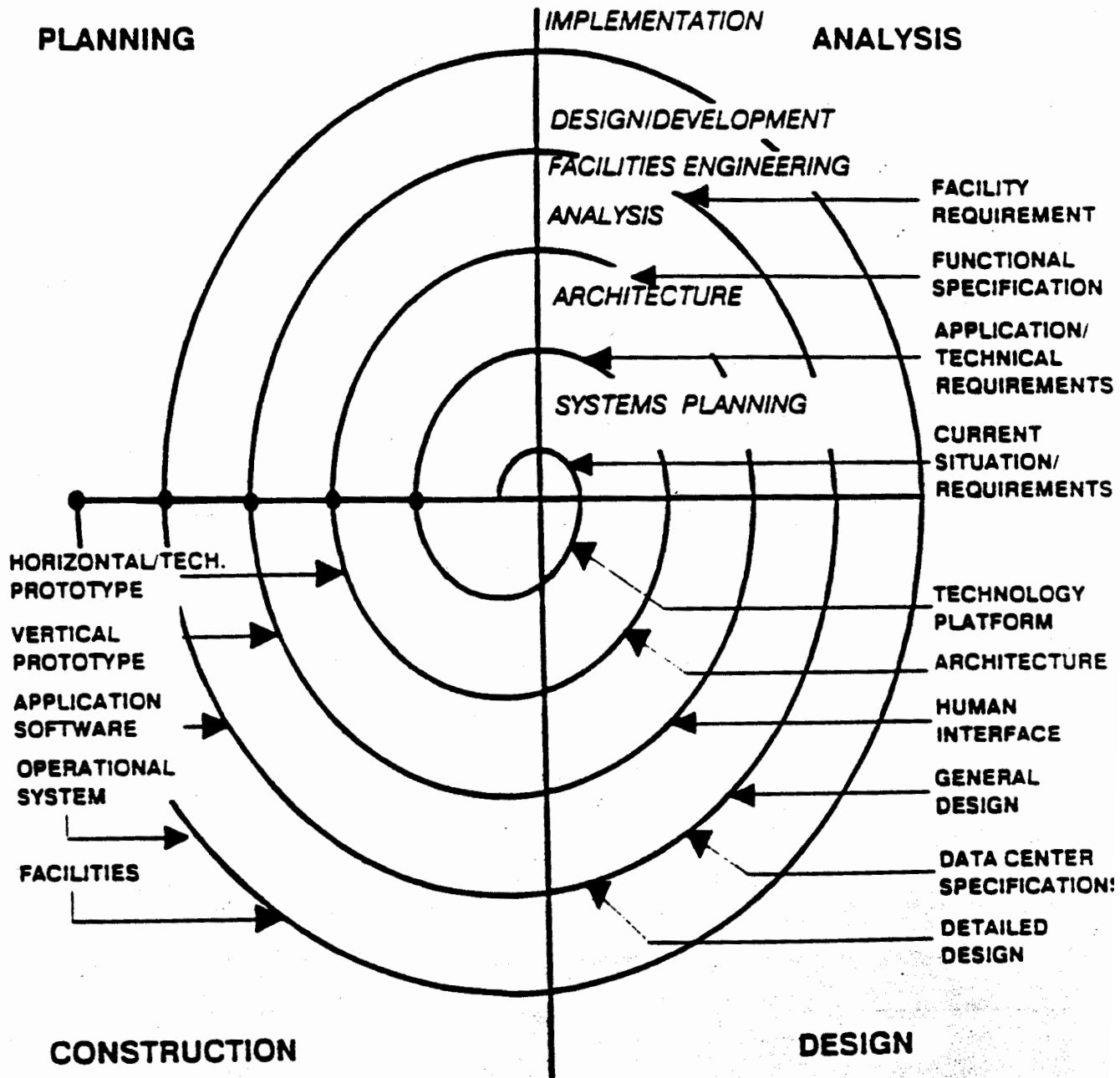


Figure 2-2

2.3.3.2 Project Control

Project control consists of a number of concepts, tools, and procedures of project management. Figure 2-3 defines a project as a situation with three key entities:

- A well-defined end-product
- An *individual* responsible for delivering the end-product
- An *individual* responsible for accepting the end-product

The project management process begins when a deliverer, the Project Manager, makes a commitment to produce an end-product for an Acceptor. It ends only when the Acceptor accepts full responsibility for the end-product. Between these two events, the Project Manager is in control of the project.

During the project, visibility is essential in ensuring that management of the organizations involved are committed to the project and well-informed on its progress. Important tools for maintaining visibility are:

- For each project, all participants and their respective roles should be defined in the *Project Organization Chart*.
- The Head of the LIS Unit should serve in an overall high-level *Project Director*, initiating projects, monitoring their progress, and taking action if a project needs corrective action. In essence, this role involves managing the project managers of the various projects.
- The Project Manager of the Gateway Project is in a key position. This person should have the responsibility to ensure the proper *integration* of the Gateway, Workstation, and Advanced ILIRN projects.
- The Gateway Project should have a *Technical Architect*, a senior technical resource who would be responsible for the technical integrity of all the projects for the new Library.
- The *Project Plan* should define the scope, deliverables, tasks, estimates, and schedule.
- The *Project Book* should serve as the central repository for all project documentation.

- On a weekly basis, the *Project Status Report* should address project progress and areas requiring attention. It should present a clear picture of the project's status and the plans for the next period.
- The *Project Tracking Report* should detail what has been accomplished (person-hours by task, and which tasks are completed) and what the real remaining effort will be (person-hours to complete). The task level data should be summarized at higher levels for management reporting.
- Monthly or at key points, the Project Manager, the Acceptor, and their two line managers should meet as a *Steering Committee* to review status, responsibilities, scope controls, and significant unresolved issues. The Steering Committee must include Barbara Fischler, Kris Froehke, and Garland Elmore.
- To avoid budget and schedule overruns, the *Change Control* process should be used as the vehicle whereby scope changes and their impacts are documented and agreed to by both the Acceptor and the Project Manager.
- Lack of information or decisions can have a significant impact on the productivity of the project team. A formal *Decision Request* process which involves the formal submission of an issue to the Acceptor for a decision should be used.
- The Library's acceptance test team should complete *Project Fault Reports* to log problems encountered where a system is not performing as per the specifications. The Reports will act to deter unnecessary changes and help ensure the timeliness of problem resolution.
- Once a deliverable has completed the review process and is deemed to be acceptable, an *Acceptance Document* should be completed by the Project Manager and signed by the Acceptor. This process emphasizes individual responsibility and indicates that the deliverable has been completed successfully, allowing the project to proceed safely with the next deliverable.

Project Model

End-Product

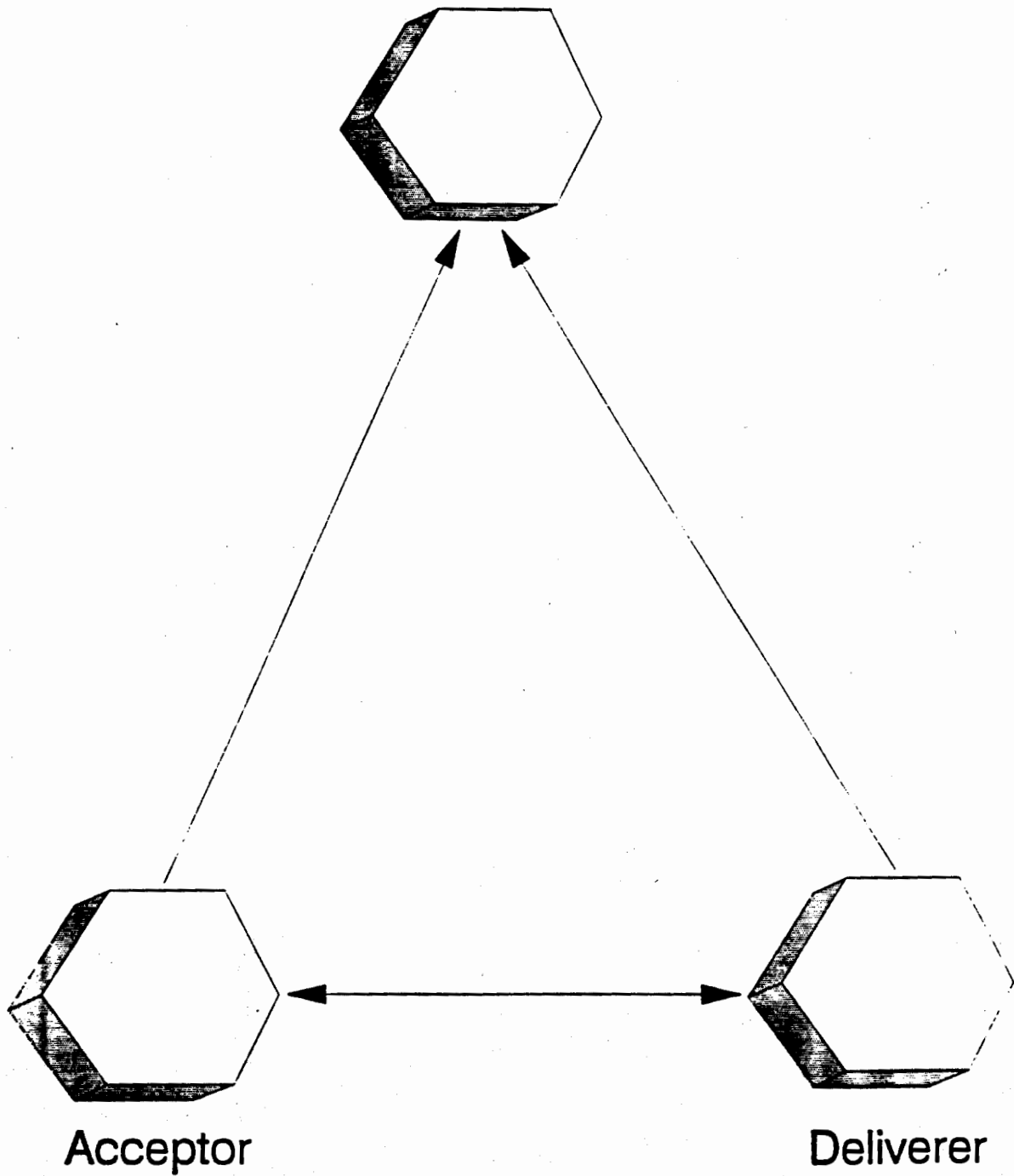


Figure 2-3

2.3.3.3 Tools and Techniques

The following items are valuable information systems development tools and techniques which should be considered for use on a project-by-project basis. Some are useful for any project; others would be recommended for only certain types of projects:

- Computer Aided Software Engineering (CASE) tools
- Prototyping
- Structured Techniques
- Joint Application Development (JAD)
- Entity-Relationship Modelling
- Development Standards
- Capacity Analysis and Planning

3. COSTS AND BENEFITS

3.1 Summary of Benefits

In addition to overcoming the disadvantages of the paper medium, the electronic library offers a number of important advantages over traditional libraries:

- Information can be accessed from workstations virtually anywhere.
- Access can be much faster than with paper materials.
- Many different media such as video and audio can be integrated and used.
- Computers can be used for searching and retrieval.
- A much greater volume of information can be made accessible for information mining. An electronic library can act as a filter to help patrons select the most relevant and highest quality information from the growing deluge of published information.
- In the long-term, electronic libraries offer the potential of being less costly than traditional libraries of similar sizes.
- Information can be more current. This is especially important in rapidly advancing fields such as engineering.

What are the implications of such a facility to IUPUI and its students, faculty, and staff?

- By providing expanded access to greater amounts of knowledge, information, and data, the Library will improve the quality of education and research at IUPUI. This will increase IUPUI's contribution to Indiana's educational levels and to the world's knowledge base, thereby enhancing its standing in the academic community.
- The electronic information environment will serve to attract more and better students and faculty to IUPUI.
- There will be increased community awareness of and reliance on IUPUI as an information resource.

- Similarly, usage of Library facilities by the private and public sectors will benefit those sectors and enhance their relationship with the University.
- The Library will increase the number of personal computers available to students. Increased computer access on campus will allow expanded curriculum opportunities.
- Specialized workstation facilities available at the new University Library will enrich the educational experience for handicapped students.
- Students, faculty, and staff productivity will be increased. They will spend less time on the mechanical aspects of information access. If the systems result in an average saving of fifteen minutes per month, say, per student and faculty member, the net saving would be **6,250 person-hours per month** (assuming the equivalent of about 25,000 full-time students and faculty). Faculty could spend the saved time on academic activities. Students would presumably spend their time on their studies, or, it may simply ease the burden of being a commuting student with job and family obligations.

3.2 Summary of Costs

The Phase I Project Cost Distribution spreadsheet shows a summary of one-time and ongoing costs for each project for each fiscal biennium. The following major assumptions have been made:

- The costs are for Phase I projects only. Development of Phase II should begin in late 1992 and would entail significant expenditures.
- The costs provided herein are initial **estimates**, provided for budgetary purposes only. Actual costs could vary significantly, particularly for later project phases. The software development estimates in this plan are based on only a high-level understanding of the requirements and will need to be refined as part of the project initiation sub-phase of each project. For some projects, the amount of software development which will actually be necessary is still very unclear due to the emerging nature of the technology involved.
- If the University Library uses resources outside of IUPUI to complete projects, additional resource hours will be required to develop proposals and then analyze the various responses.
- In calculating data processing staff costs, standard Indianapolis Computing Services rates have been used. If other sources of manpower are used instead, costs could be considerably higher. The person-month costs for Indianapolis Computing Services staff are based on a \$30 per hour rate at 8 hours per day for 21 workdays per month. The staff categories used are: Project Manager, Lead Analyst/Programmer, Senior Analyst/Programmer, Technician, and Programmer. Note that some resources are part-time, as indicated by the person-month estimates compared with the elapsed time estimates.
- It is assumed that ICS will provide accommodation and workstations for data processing system project staff.
- Hardware costs are estimates; actual costs will vary.
- The project cost estimates include funds to replace hardware. This money will be carried over each year and supplemented to provide resources for future hardware replacement.
- Computer processing costs have been estimated using the following equation:

(Number of programmer hours X 75%) X \$.85 (ICS hourly connect time charge) X 4 (to include DASD and CPU processing charges)

- Ongoing operating costs are included where appropriate.
- Inflation and the present value of money have not been taken into account in estimating costs.
- In the project cost distribution spreadsheet, allocations of one-time costs and ongoing costs across the biennia are highly dependant on the schedule and are subject to variance.
- Because a policy on charging back costs to Library patrons has not yet been determined, chargeback revenues have not been included in the financial models. These revenues could offset some of the costs.

IUPUI University Library Information Systems Plan

Phase I Project Costs

<i>Projects</i>	<i>July 1989 through June 1991 One-Time Costs</i>	<i>July 1991 through June 1993 One-Time Costs</i>	<i>Total One-Time Costs</i>	<i>Annual Ongoing Costs</i>
Building Wiring	\$15,000	\$2,968,600	\$2,983,600	\$1,032,500
Workstation (WORKS)	\$400,000	\$6,192,540	\$6,592,540	\$2,614,053
Database Acquisition	\$0	\$85,440	\$85,440	\$197,040
Gateway	\$250,000	\$403,360	\$653,360	\$86,460
Advanced ILIRN	\$30,000	\$118,378	\$148,378	\$10,886
Management Information Systems	\$0	\$72,070	\$72,070	\$5,040
Public Information Display System	\$0	\$77,800	\$77,800	\$17,840
Configuration Management System	\$0	\$42,320	\$42,320	\$2,300
Chargeback Feasibility Study	\$35,280	\$0	\$35,280	\$0
Multi-Media Systems	\$300,000	\$2,779,320	\$3,079,320	\$1,620,400
Support Infrastructure	\$75,000	\$0	\$75,000	\$102,500
Training	\$0	\$210,000	\$210,000	\$175,000
TOTALS	\$1,105,280	\$12,949,828	\$14,055,108	\$5,864,019

3.3 Priorities

This section examines the relative priorities of the projects and the implications of not doing a particular project.

- The Building Wiring, Workstation Platform, and Gateway Projects are considered fundamental to achieving Library objectives.
- The Building Wiring Project includes funding for full fiber optic wiring as well as installation monitoring. Both items are considered essential. Without proper installation of a fiber optic network, the Library will be obsolete before it opens. Installation of a non-fiber network would probably entail complete replacement with fiber within five years, thereby incurring substantially higher wiring costs over the five year period.
- Most of the proposed expenditures are related to the Workstation Platform Project (WORKS). It is an essential project in that the workstations will be the vehicle through which patrons and staff will access the electronic information systems. Each WORKS subproject is similarly essential. However, the number of workstations and/or prototypes could be reduced should complete funding be unavailable.
- Without the Gateway Project, system users will experience aggravating technical impediments in accessing many of the new Library information systems.
- Database Acquisition is important. Installing a sophisticated workstation network without providing adequate data resources for those workstations to access severely depreciates the benefit of the investment. There will be a number of IU databases which the workstations will already be able to access, but those databases are not considered to be sufficient.
- Development of Advanced ILIRN could be delayed by making interim enhancements to the existing ILIRN.
- The Management Information Systems Project will be partially addressed through Indiana University Libraries development of NOTIS/IO reports.
- The PUBS Project is highly desirable, but it is not an essential project. Patrons could address their queries to Library staff.
- Configuration Management could be done manually, but this could cost more time and money, especially through errors, than automating the function.

- **The Chargeback Feasibility Study is essential, but could be scheduled for later. The problem in delaying it is that the Library will continue to supply some resources which it might otherwise be able to charge back to the user.**
- **The Multi-Media Systems Project is essential to integrate video and audio media within the information architecture of the new Library. It will provide advanced facilities for multi-media playback.**
- **The Support and Training Projects are also considered essential. The substantial investment to be made in the Library information systems would be poorly-spent if the ongoing support of the systems was inadequate or if users were unable to fully-benefit from them.**

A significant proportion of the expenditure is required just to keep up with typical academic libraries. The rest of the expenditure is needed to establish and maintain the leading position which IUPUI has set as a primary objective of the new Library.

APPENDIX A - GLOSSARY

This glossary includes explanations for terms and acronyms found in the Current Situation and Requirements Report, the Conceptual Solution and Integration Design Report, and this report.

- ABI/INFORM** - Business database produced by UMI
- ACRL** - Association of College and Research Libraries
- Appletalk** - Local Area Network technology
- ARPAnet** - Advanced Research Projects Agency Network- Electronic interactive network developed for the military
- ASCII** - American Standard Code for Information Interchange
- B-ISDN** - Broadband Integrated Services Digital Network
- BARS** - Bursar Accounts Receivable System
- BaTASystem** - Baker and Taylor Electronic Book Ordering Service.
- BISAC** - Book Industry Systems Advisory Committee
- BITNET** - Because It's Time Network. International interuniversity electronic communications network through which messages are routed from computer to computer to final destination
- Bridge** - Physical device with software that links one network and its resources with another via the Data Link layer
- BRS** - BRS Information Technologies, a commercial online database vendor
- BRS/SEARCH** - A full-text storage and retrieval software product from BRS
- CANMARC** - Canadian machine readable cataloging
- CD ROM** - Compact Disc Read Only Memory
- CD-I** - Compact Disk Interactive
- CIALSA** - Central Indiana Area Library Services Authority
- CICnet** - An Internet network belonging to the Committee on Institutional Cooperation. The CIC consists of the Big Ten schools.
- COMARC** - Cooperative Machine-Readable Cataloging Program (Library of Congress)
- Compander Group IV** - Compressor Expander (Telecommunications)
- Compuserve** - A videotex service providing online information and communication services.
- DASD** - Direct Access Storage Device

Integration Implementation Plan Report

DECnet	- Telecommunications protocol developed by Digital Equipment Corporation
DFM	- Download-Filter Manager
DIALOG	- A commercial online database vendor
DOD	- Department of Defense
DVI	- Digital Video Interactive
EBCDIC	- Extended Binary Coded Decimal Interchange Code
EDI	- Electronic Data Interchange
EDIN/STATIS	- Economic Development Information Network/Statistics. Indiana University produced statistical database
EISA	- Extended Industry Standard Architecture
EPIC	- OCLC online reference service
ERIC	- Educational Resources Information Center - Education bibliographic database
Ethernet	- Local Area Network technology
FAX	- Facsimile Transmission- a system for transmitting images over a communications network
FTP	- File Transfer Protocol
GTO	- Generic Transfer & Overlay
GUI	- Graphical User Interface
HDTV	- High Definition Television
I/O	- Input/output
ICFAR	- Indianapolis Center for Advanced Research
ICS	- Indianapolis Computing Services
IHETS	- Indiana Higher Education Telecommunication System
ILRN	- Indianapolis Library Information and Resource Network
ILL	- Interlibrary Loan
IMAGIS	- Indianapolis Mapping and Geographic Infrastructure System
INCOLSA	- Indiana Cooperative Library Services Authority
INFOTRAC	- Database product of Information Access Company

Integration Implementation Plan Report

INTELENET	- Indiana Telecommunications Network
INTERNET	- An international network of networks based on TCP/IP
IO	- Information Online - Indiana University Libraries automated library information system which is based on the NOTIS library system package
ISDN	- Integrated Services Digital Network
ISO	- International Standards Organization
LAN	- Local Area Network
LC MARC	- Library of Congress Machine Readable Catalog
LinkWay	- IBM personal computer GUI software which will be used to link the automated library systems of the Indiana state universities
LINX	- Faxon Company automated serial database
LIRN	- Library Information and Reference Network
LIS	- Library Information Systems
Mbps	- Million bits per second
MDS	- NOTIS Multi-Database System which allows access to multiple databases from within NOTIS
MERP	- Medical Educational Resources Program (Indiana University)
MicroLinx	- Faxon's Microcomputer-based serials system
MIPS	- Million instructions per second
NEXIS	- Commercial remote online newspaper database
NISO	- National Information Standards Organization
NOTIS	- Northwestern Online Total Integrated System. A library system software package from NOTIS Systems Inc.
NSFnet	- National Science Foundation Network
OCLC	- Online Computer Library Center
OCR	- Optical Character Reader
OPAC	- Online Public Access Catalog
ORBIT	- Commercial online database/search service
OS/2	- IBM's new personal computer operating system

Integration Implementation Plan Report

OSI	- Open Systems Interconnection - networking interface model developed by the International Standards Organization which allows disparate computer systems to communicate
PAC	- Public access catalog
POLIS	- Project On-Line: Indianapolis Study
Protocol	- Set of rules that govern communication between computers. Such rules apply to data format, transmission timing and sequencing, and error handling.
PSYCHLIT	- Psychology database available through several vendors
RAM	- Random access memory
SAA	- IBM's Systems Application Architecture; interface and interoperability standards for applications on mainframes, minicomputers, and personal computers
SAS	- Statistical Application System. A software system for data analysis
Search CD 450 Protocol	- OCLC's CD ROM retrieval software
SilverPlatter	- CD ROM vendor
SISAC	- Serials Industry Systems Advisory Committee
SMTP	- Simple Mail Transfer Protocol
SNA	- IBM's System Network Architecture
SULAC	- State University Library Automation Committee
SULAN	- State University Library Automation Network
TCP/IP	- Transmission Control Protocol/Internet Protocol. A transport and Network layer protocol developed by the Department of Defense. Primarily used for linking different computers in large networks
TELENET	- Public packet-switched data network that supports long distance communications between terminals and computers
TFTP	- Trivial File Transfer Protocol
Token Ring	- Local Area Network technology
TYMNET	- Telecommunications network which supports online information retrieval and other computer applications
UDP	- User Datagram Protocol
UKMARC	- United Kingdom Machine Readable Catalogue
UMI	- University Microfilms International

Integration Implementation Plan Report

- UNIX** - Operating system developed by AT&T Bell Laboratories which is portable to a wide variety of computers
- Video Head-End** - Distribution and switching point for video signal
- WAN** - Wide Area Network
- WYSIWYG** - "What You See Is What You Get"
- Z39.50** - A standard for the exchange of messages between two computer applications for the purpose of information retrieval